Exhibit 96.1

Technical Report Summary on the Darling Range, Western Australia S-K 1300 Report

Alcoa Corporation

SLR Project No: 410.064663.00001

February 23, 2023

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1.0 EXECUTIVE SUMMARY

1.1 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, 2022. 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.

1.1.1 Conclusions

1.1.1.1 Geology and Mineral Resources

- The QP is independently declaring the 31 December 2022 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 the QP.
- As of December 31, 2022, exclusive of Mineral Reserves, as summarized in Table 11-5 at an appropriate level of precision reflecting confidence, the Measured Mineral Resources are estimated to be 44.9 Mt at a grade of 31.2% available alumina (A.Al2O3) and 1.15% reactive silica (R.SiO2). Similarly, the Indicated Mineral Resources are estimated to be 51.8 Mt at 31.4% A.Al2O3 and 1.17% R.SiO2, and the Inferred Mineral Resources are estimated to be 140.3 Mt at 32.9% A.Al2O3 and 1.26% R.SiO2.
- 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 QP's opinion, the QA/QC of sample preparation and assaying is adequate, and the assay results are suitable for use in Mineral Resource estimation.
- 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 QP based on the studies on FTIR repeatability that the overall precision and accuracy of the FTIR assaying is acceptable.
- The database is adequate, and the data is appropriate for the purpose of Mineral Resource estimation.
- The continuous improvements in the geological modelling, estimation techniques, and block model migration to the 3D approach are appropriate and constantly improve the confidence level and precision of the Mineral Resources.

- The dry bulk density data is less well controlled than other analytes, although different attempts were taken since 1980. However, based on the different reconciliation approaches and on the fact that the polygonal and GSM model have lower confidence level, the density values are acceptable for the Resource estimation.
- 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 that the modelling is appropriate for the purpose.

1.1.1.2 Mining and Mineral Reserves

- As of December 31, 2022, Proven Mineral Reserves are estimated to total 145.8Mt at 31.4% A.Al2O3 and 1.2% R.SiO2 and Probable Mineral Reserves are estimated to total 255.8Mt at 32.4% A.Al2O3 and 1.2% R.SiO2.
- The QP has used the December 31, 2022 Mineral Resource estimate as the basis for its Mineral Reserve estimate, applying Modifying Factors only to those Resources classified as Measured Mineral Resources and Indicated Mineral Resources.
- 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. The review of the Capex FEL 2 report for the Myara North Crusher move has provided further support. Consequently, the QP considers that support by a Feasibility Study is demonstrated by the 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.

1.1.1.3 Mineral Processing

- The operating data between 2010 to 2021 indicates that the product from the Darling Range operations consisted of an average A.Al2O3 grade of 33%, with R.SiO2 below the target for refinery feed.
- The QP 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.

1.1.1.4 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.
  - 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.
- Sealed access roads to the main hubs have been established, connecting Huntly and Willowdale to the road network.
- 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 74% of the total Department of Water and Environmental Regulation license allocation (for those sites where

abstraction occurred). An additional 336,105kL 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 pits before covering with topsoil and reforesting.

1.1.1.5 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.
- A groundwater monitoring program commenced in H2 2022 across the Darling Range operations to support approvals and operational monitoring.
    - Alcoa will continue to expand its monitoring program, as necessary, if groundwater quality or quantity has been identified as potentially at risk due to operational or 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 have most recently been reported within the 2021 Annual Environmental Review report. Consistent with the outcomes reported between 2018 and 2020:
    - Review of the most recent report, published for 2021 largely reported compliance with environmental commitments and success of operational controls to managed environmental objectives.
- Only a small number of reportable environmental incidents were noted; none of which represent a risk that could adversely affect its license to operate.

1.1.2 Recommendations

1.1.2.1 Geology and Mineral Resources

It is apparent to the 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 constraints establishing forestry, heritage and noise limits to the Mineral Resource definition. 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:

- Continuing to replace the GSM and polygonal areas to the 3D block modelling methodology, using a script-based semi-automated approach, which enables more robust rapid model building. The validation of interpolation parameters using risk-based (conditional simulation) techniques to quantify confidence should be considered.
- To improve the reporting of recoverable resources, a re-blocked block model to a minimum practical mining scale or single mining unit (SMU) should be considered. Economical parameters considering more flexible costs and bauxite prices related to the Mineral Reserves can also be implemented in the Mineral Resources workflow, aiming to optimize the bauxite mineable portion including potential marginal grades.
- Investigate whether the 5% bias in the tonnage between the As Mined and sampling tower weightometers is persistent in the 3D block models.
- Further redrilling or where viable re-assaying of pulps
- 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).
- To include 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 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 QP's opinion, the reintroduction of field duplicates using appropriate riffle splitters under supervision should be considered.

- The QP is of the opinion that the grade characteristics of the bauxite profile could be reproduced in the model, which enables 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.

1.1.2.2 Mining and Mineral Reserves

- Currently a dilution and mining recovery factor is applied to the final Reserves to reconcile the tonnes and grade. The 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 mining output that defines Reserves).

- The QP recommends detailed haulage analysis focusing on haulage profiles and cycle times to provide more accurate operating costs.

- The 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.

1.1.2.3 Mineral Processing

The historical operational data for the Darling Range demonstrates that ore consistently met refinery specifications.

- Ideally, independent verification of sample analysis is conducted, by a certified laboratory, on a structured program, to ensure the QA/QC aspects of the internal analysis. Within this process 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.

- The QP is appreciative that the mine is operational, meaning a trade-off versus logistics / practicality would need to be carried out.

1.1.2.4 Infrastructure

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. The QP make no recommendations regarding infrastructure.

1.1.2.5 Environment

Alcoa has established systems to facilitate adherence to environmental commitments. The QP recommends that the following actions are taken to monitor previously enacted corrective actions, made in response to minor environmental incidents:

- Additional monitoring should be undertaken post-implementation of corrective actions to demonstrate their effectiveness, in particular:
    - following drainage failures related to significant rainfall events, which resulted in surface water flow from dieback areas into dieback free areas.

- following recordings of elevated turbidity for a period exceeding the compliance criteria (25 NTU).
- in response to incidents involving PFAS and AFFF contamination.

1.2 Economic Analysis

1.2.1 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 2023 to 2031, 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, 2023
Mine Life based on Mineral Reserves	9 years
Average LOM Price Assumption	$21.00
Total Operating Costs	$4,330.6 million
Capital over nine years	$603.2 million
Income tax	$472.5 million
Discount Rate	12.25%
Discounting Basis	End of Period
Inflation	0%
Corporate Income Tax Rate	30%

1.2.2 Cash Flow Analysis

The indicative economic analysis results, presented in Table 19-3, indicate an after-tax NPV of $463.9 million at a 12.25% discount rate and an average bauxite price of $21.00/t over LOM.

Capital identified in the economics is for major mine moves, conveyor replacements, haul roads, and other sustaining operations.

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	9
LOM Bauxite Production	Mt	327.8
Average LOM Price	$/t	21.00
Gross Revenue	$ million	**6,895.3**
Labor	$ million	1,597.4
Service	$ million	617.0
Other	$ million	722.8
PAE – Corporate Chargebacks	$ million	194.4
Energy	$ million	119.7
Fuel	$ million	218.9
Supplies	$ million	225.1
Maintenance	$ million	547.6
On-site Mine Operating Costs	$ million	**4,242.9**
Off-site Mine Operating Costs	$ million	**87.7**
Corporate Income Tax	$ million	472.5
Net Income after Taxes	$ million	**1,102.5**
Depreciation Tax Savings	$ million	989.7
Sustaining Capital (2023 to 2031 inclusive)	$ million	$602.8
Closure Costs	$ million	Included in ARO under operating costs
Free Cash Flow	$ million	**882.7**
NPV @ 12.25%	$ million	**463.9**

1.2.3 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 market prices (revenues) followed by operating costs.

1.3 Technical Summary

1.3.1 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.

1.3.2 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.

1.3.3 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.

1.3.4 History

Bauxite occurrences were first recorded in the Darling Range in 1902. Bauxite was detected as a result of analyzing 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 Aluminum 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.Al2O3. 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 December 2022, the Huntly and Willowdale mining operations remain active. Huntly supplies bauxite to the Kwinana and Pinjarra refineries (approximately 25 million tonnes per annum, Mtpa) while Willowdale supplies the Wagerup refinery (approximately 10 Mtpa).

1.3.5 Geological Setting, Mineralization, and Deposit

The Mineral Resource estimates declared in this Technical Report Summary 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.Al2O3) and low in reactive silica (R.SiO2).
- 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.Al2O3 and low in R.SiO2.

- 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.SiO2 and low in A.Al2O3.

The Hardcap and Friable Zone are targeted as the ore horizon. Selective mining practices are applied to minimize the inclusion of Overburden, because of its elevated organic carbon levels, and Basal Clay because of its elevated R.SiO2 concentrations. Within the Hardcap and Friable Zone, the dominant minerals, in order of abundance, are gibbsite, quartz, goethite, kaolinite, and hematite, with lesser amounts of anatase and muscovite.

1.3.6 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 2022 Mineral Resource estimates were derived from data acquired from a total of 332,017 holes, drilled between 1981 and 2022, 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 dispatch 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.

1.3.7 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 38% of the tonnages that contribute to the current Mineral Resource (exclusives Mineral Reserves) 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.Al2O3 and R.SiO2 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.Al2O3 and R.SiO2 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.Al2O3, R.SiO2, 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.Al2O3 is biased low but has shown a gradual improvement from 5% to 1%, relative over the past decade. The As Mined R.SiO2 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 nowadays the minority of the Mineral Resource estimates (inclusive Mineral Reserves) 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, geological modelling and block model criteria, and data quality.

1.3.8 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 QP inspected the Alcoa Huntly and Willowdale operations and Mine Planning Department between October 27th and 1st November 2022 and visited Alcoa's Mine Planning department on November 2nd and 3rd 2022, interviewing relevant personnel on these dates and on other occasions. The QP has prior knowledge of the asset being involved in the previous Mineral Reserve Statement in the preceding year (2021/22).

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 within a current mining region 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 or from Measured resources that are outside the current mining regions.

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.Al2O3) and reactive silica (R.SiO2), this being the critical contaminant in relation to the Refinery.

1.3.9 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.

1.3.10 Processing and Recovery Methods

The QP notes in accordance with the mine planning reviewed, total (T.SiO2) and R.SiO2 contents, on an annual average basis, remains 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.

1.3.11 Infrastructure

The infrastructure for the mining operations is established and operational. During 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 new administrative offices, as well as crushing facilities and maintenance facilities. The Orion Hub site has been decommissioned.

Extensive haul road networks, rail, and overland conveyors transport crushed bauxite from the Hubs 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 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 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.

1.3.12 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, during 2022 Alcoa Corporation had 27 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 2022, total Alcoa production was 42.1 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. Following the expiration of the third-party sales contract at the end of 2021, all bauxite production from Huntly and Willowdale was consumed internally by the Darling Range.

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.

A price of $19/t has been utilized for 2022 with an estimate for economic market-based factors applied throughout the LOM.

1.3.13 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).

Baseline studies completed in 2021 (16) and 2022 (3) for the revised mining proposal areas are available 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 for future mining areas 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 reported in August 2022, indicating compliance with environmental commitments and success of operational controls to managed environmental objectives, with only four (4) reportable incidents noted.

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 centers 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, Jarrahdale 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.

1.3.14 Capital and Operating Cost Estimates

Alcoa forecasts its capital and operating costs estimates based on annual budgets and historical capital and operating costs over the long life of the current operation.

1.3.14.1 Capital Costs

The operation is well-established, and the LOM plan does not envisage any significant change of the production rate over the LOM. Anticipated future major capital expenditure is related to major mine moves and sustaining the on-going operations.

Projected capital expenditure over the next nine years of mine life is estimated to total $603 million. Of this total, $158 million is associated to complete the mine move to the Myara North site. Capital for the Holyoake move is estimated to be $241 million.

A breakdown of the major expenditure areas and total expenditure over the 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
Mine Moves	399	66.2%
Conveyor Belt Replacements	69	11.4%
Haul Road Improvements	55	9.1%
Other Sustaining capital	80	13.3%
Total	**603**	**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 generally be classified as Class 1 or Class 2 with an expected accuracy range of -3% to -10% to +3% to +15%.

1.3.14.2 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 nine years are based on the 2023 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 2023 and average mine operating costs for the nine-year LOM are shown below in Table 1-4.

Table 1-4: LOM On-site Mine Operating Costs by Category*

Cost Centre	2023 ($/wmt)	Average LOM ($/wmt)	Percentage of Operating Cost
Direct Labor	$3.43	$4.87	38%
Services	$2.07	$1.88	15%
Other	$1.45	$2.21	17%
Corporate Chargebacks for support services	$0.53	$0.59	5%
Energy	$0.34	$0.37	3%
Fuel	$0.37	$0.67	5%
Operating Supplies and Spare Parts	$0.44	$0.69	5%
Maintenance (fixed plant and mobile fleet	$1.06	$1.67	13%
Mine Operating Cash Cost ($/wmt)	**$9.70**	**$12.95**	**100%**
Off-site Costs			
G & A, selling and other expenses	$0.28	$0.24	
R & D Corporate Chargebacks	$0.03	$0.03	
Total Cash Operating Costs	**$10.01**	**$13.21**	

**Due to rounding, numbers presented may not add up precisely to the totals provided.*

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 December 2022, the Huntly and Willowdale operations together employ a total of 887 employees consisting of 48 technical, 77 management and 762 operations employees. Additionally, 67 employees are centrally employed on the combined operations.

2.0 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, 2022. 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. This Technical Report Summary updates the TRS titled "Technical Report Summary for Darling Range, Western Australia," with an effective date of December 31, 2021, that was prepared in accordance with S-K 1300 and Item 601(b)(96) by SLR for Alcoa.

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 across nine countries. 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 35 Mtpa of bauxite, with approximately 25 Mtpa from Huntly and 10 Mtpa from Willowdale.

2.1 Site Visits

SLR Qualified Persons (QPs) visited the sites between October 27th to November 3rd, 2022. The SLR Geologist 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 and operations overview at Alcoa's Pinjarra office (Bindjareb). SLR's mining engineer was provided a general overview of the transitional process used to develop the 3d block models from the historical gridded data. The process was developed in the DeepLime platform, a scripted platform to facilitate the transition. Following the overview, the visit moved to the Pinjarra refinery for a discussion with management regarding the Capex planning and operational costs.

The following day, 28th October, SLR's Geologist joined the visit team. The group undertook an inspection of the Huntly mine site. A review of the drilling operations was initially undertaken, this incorporated confirmation of sample selection process from the drilling and generally to review the QA/QC procedures. Drilling rig 9011 was operating, and three holes were observed being drilled and sampled. The restoration, rehabilitation of a mine out hill area was then reviewed. This was followed with the inspection of the procedures for organic stripping to review the interface of the domains to the upper bauxite layer as related to confirm the dilution assumptions as appropriate.

Occasional areas of sterilization were observed as small protective circular islands approximately 30m-50m diameter. The full section profile of the operation could be surveyed in this sterilized island. Restoration after stripping on steeply inclined fills was also noted, confirming the ability to mine at the gradients noted in the Reserve estimation.

A further mining hill pod was inspected, operations were cutting the pre-stripped organic layer to provide the main bauxite excavation. EX 1021 excavator was stopped, and the excavated face inspected. Potential for dilution was reviewed and confirmed as suitable. Visit then stopped at the main Myara (Huntly) crusher station to review the primary crushing operation. The twin hopper station was observed from distance as four number 200t trucks tipped. The trucking was not utilizing the surge area at the time.

Haul roads were in excellent condition and of suitable design and width to accommodate the Cat 789c (190t) trucks. Segregation and right-angle crossing points for light vehicles were at high standard. Infrastructure for plant and water management was of a very high standard.

Discussions with Huntly site engineering team took place over the 4 hour visit to the various mining areas. The Digital fleet management system (FMS) was reviewed at the Myara site. The mine dispatch office was reviewed. Controls for the Myara main surge area before the Primary Crusher, the Primary Crusher itself and the controls for the conveyors and stackers downstream were also viewed. The 17 No trucks all have telemetry data, as do all excavators and dozers, 10 dozers (D11 to D10 size), 4 No Cat 993 size front load shovels, 5 No prime excavators (EX 2600, PC 3000), plus various other ancillary equipment to operate one of the world's largest bauxite mines.

Site visit on the Monday 31st of October started in the Pinjarra mine office (Bindjareb). The Geological team provided an overview of H07_Holyoake_Central modelling approach. Optimization, depletion related to constraints, cut off grades etc. were all reviewed. This model was also taken forward to the mining review and reconciliation by QPs as part of the audit review process. The model was also reviewed at Alcoa Head Office on the 2nd of November.

Inspection was then undertaken of the lab facilities at Kwinana refinery and the independent labs (Bella Analytical Systems PTY Ltd) used for the ore sample preparation and testing. The drilled packet samples are brought to this lab for preparation and testing. Sample ID system was reviewed, and a number of online tests were reviewed by the audit review team. Sample ID J661503 was witnessed. The team then went to the main refinery to review testing procedures for other criteria and reference testing to the Bella Lab. Bomb Digest systems QXRD, XRF systems etc. were all reviewed. Historical control charts and procedures were all reviewed during the visit to gain an understanding of Alcoa's QA/QC procedures and exceeded the standard testing approach expected.

On the 1st of November and following a review of the Ore Best GIS model at Pinjarra office, the team visited 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. A relatively new black top access road has been constructed from the main highway to the Larego office complex. Larego consists of a new mine office and Mine infrastructure area. Black top car parking exists for the mine staff and personnel. An overview of the mine planning activities was provided. New and existing haul roads were all in excellent condition. The organic stripping operation, and drilling of hard cap was reviewed. Mine water treatment facilities were seen by drive by. Komatsu 730e trucks were witnessed on the haul roads. Ore loading operations were reviewed. The Mine Infrastructure Area (MIA) was noted to be very well kept order. Larego Primary Crusher was inspected (at the time down for standard repairs), conveyor sections and route to the stacker reclaimer were reviewed.

The QPs then inspected the Darling Scarp including the covered downhill conveyor, sampling station, ore stockpile stacker/reclaimer, and Wagerup refinery.

The QPs interviewed several senior Alcoa staff at the operational sites.

Alcoa provided permission to document the site visit with video, photos and audio which were shared with the other SLR team members.

QPs visited the Alcoa's Mine Planning department at Booragoon on November 2nd, 2022, for discussions about Alcoa's mine planning systems. Both of SLR's QPs carried out inspections of the Kwinana laboratory facilities, in particular the FTIR assaying procedures on 31st October 2022. Drilling methods were inspected on site on October 28th, 2022, along with an examination of the database management procedures.

The SLR Metallurgist QP did not visit the site, however, the site was visited by the Mining and Geology QPs who reviewed all Modifying Factors.

2.2 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 Global Planning
- Mr Thomas Green, Resource Development Manager, Alcoa Global Planning
- Mr Quentin Swart, Senior Resource Geologist, Alcoa Global Planning
- Mr Lucas Tuckwell, Senior Resource Geologist, Alcoa Global Planning
- Mr Peter Hill, Exploration Superintendent, Alcoa Global Planning
- Mr Levi Barnes, Exploration Geologist, Alcoa Global Planning
- Mr Francois Vorster, Senior Project Manager, Capital, Alcoa
- Mr Masud Hosain, Senior Mine Planning Engineer, Alcoa Global Planning
- Mr Neylor Aguiar, Principal Mining Engineer, Alcoa Global Planning
- Mr Scott Hann, Short Term Planning Superintendent Willowdale Mine, Alcoa
- Mr Mohammad Babei Fardvatan, Mine Engineer, Huntly Mine, Alcoa
- Mr John Greenwood, Director of Bella Analytical Services
- Mr Andrew Richardson, Senior Environmental Scientist – Approvals and Compliance – WA Mining, Alcoa

This Technical Report Summary was prepared by QPs and updates the Technical Report Summary for Darling Range, Western Australia, dated February 24, 2022, with an effective date of December 31, 2021 prepared by SLR. The documentation reviewed, and other sources of information, are listed at the end of this report in Section 24.0 References.

2.3 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

Abbreviation	Description
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

Abbreviation	Description
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

Abbreviation	Description
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 Corporation

Abbreviation	Description
SMU	Single Mining Unit
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 Aluminum NL
WMC	Western Mining Corporation Ltd
wmt	wet metric tonne
wt%	weight percent
XRD	x-ray diffraction
XRF	x-ray fluorescence
Xstract	Xstract Resources
yd^3	cubic yard
yr	Year

3.0 PROPERTY DESCRIPTION

3.1 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.

3.2 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 km², 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 2022, 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:

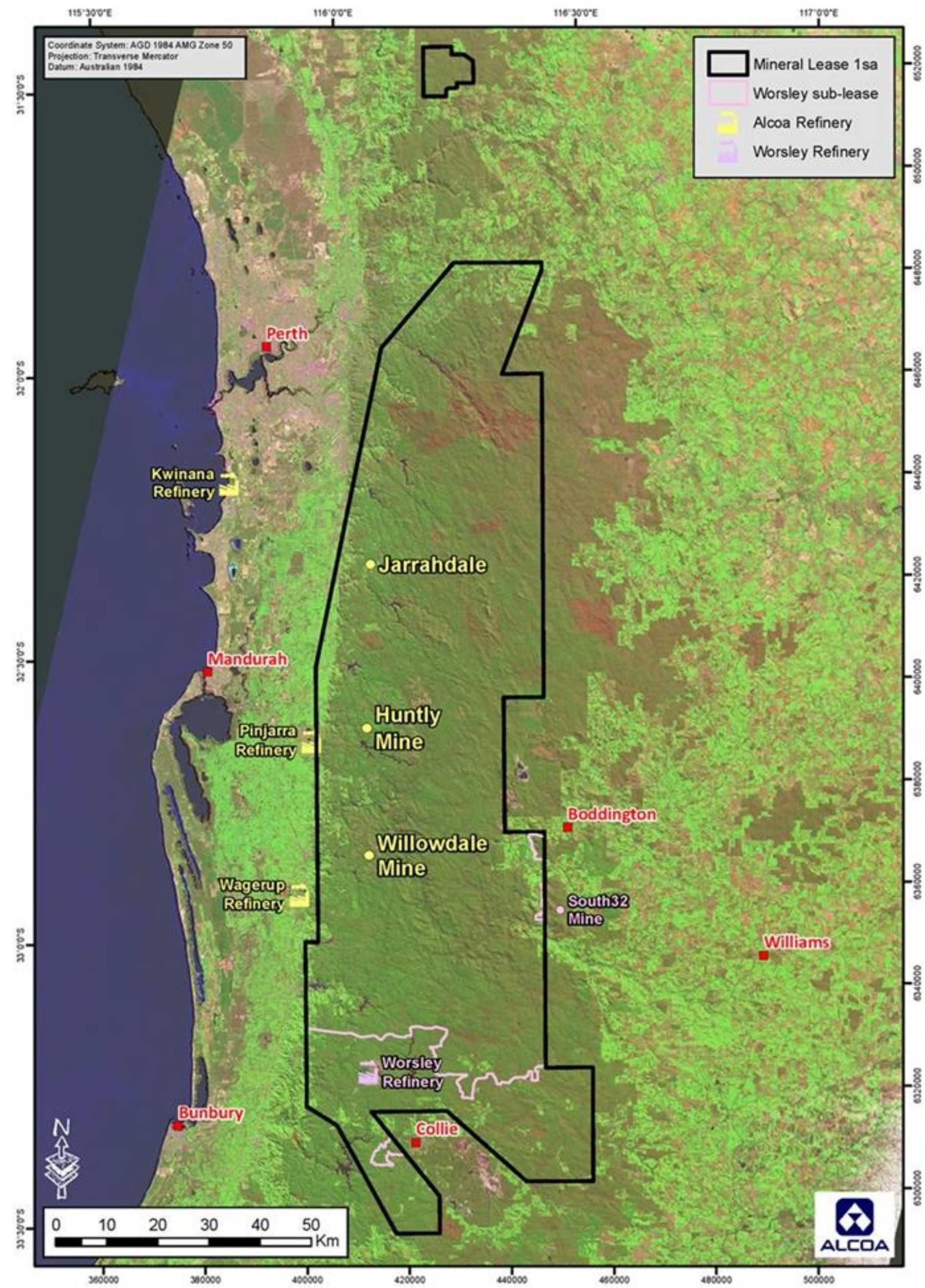


Figure 3-1: ML1SA Lease Extents (Alcoa, 2022)

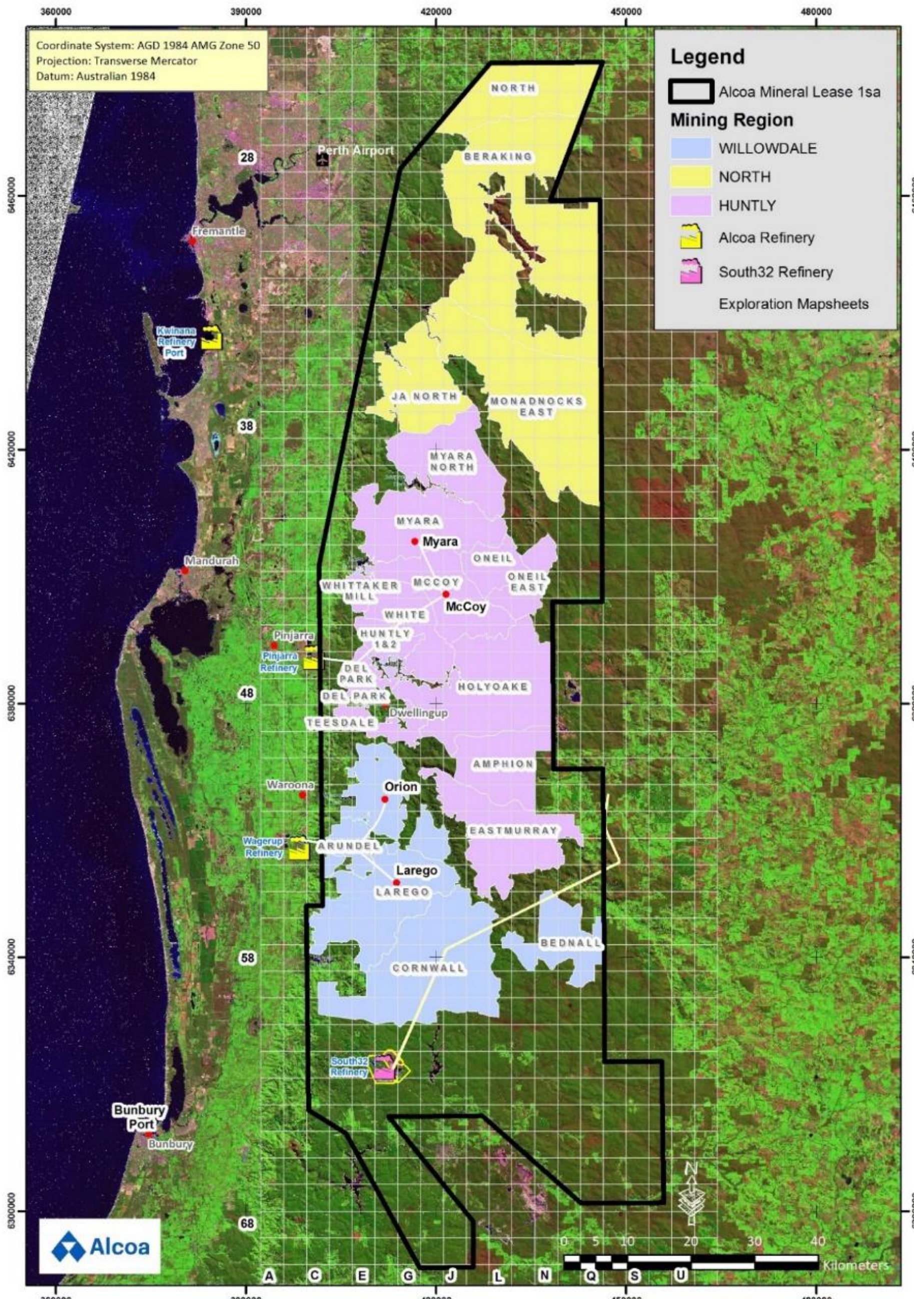


Figure 3-2: Map of Mining Reporting Centers, Mining Regions, and Production Sheets (Alcoa, 2022)

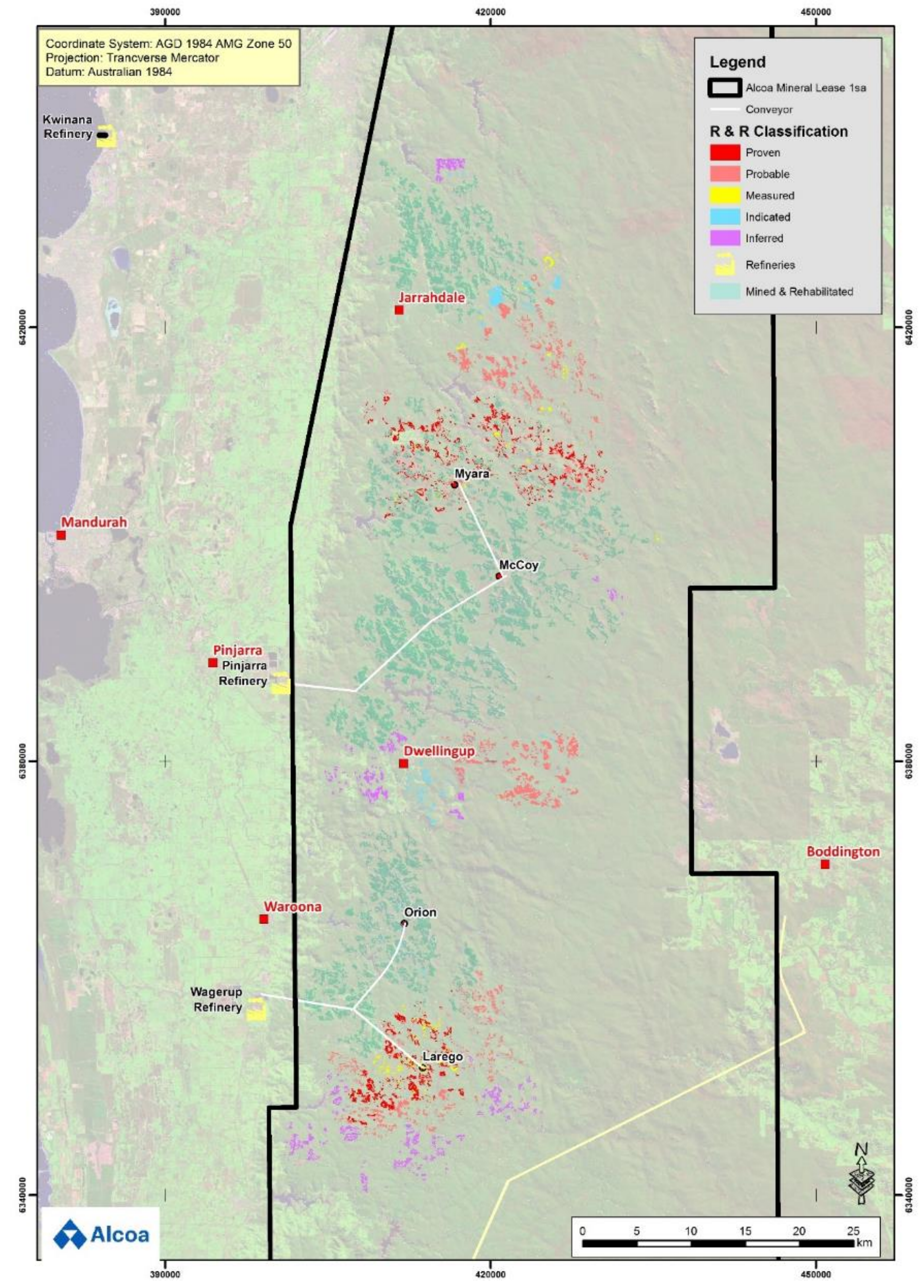


Figure 3-3: Map of Current Mineral Resource and Mineral Reserve Extents (Alcoa, 2022)

3.3 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 is 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 km² 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 km². 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:

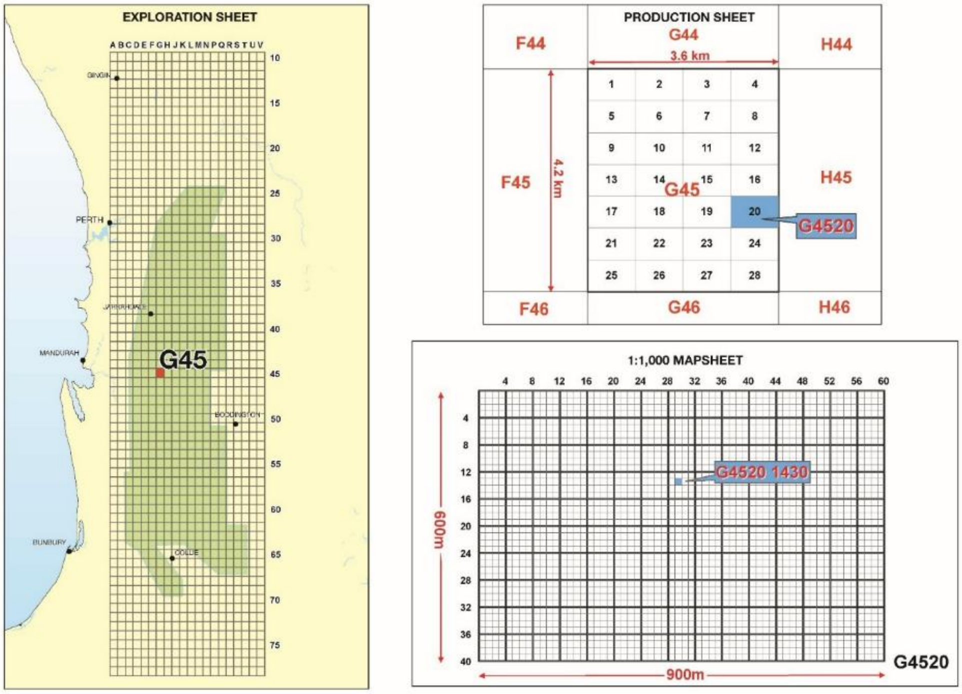


Figure 3-4: Exploration Sheet, Production Sheet, and Map Sheet Conventions (SRK, 2021)

3.4 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.

3.5 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).

3.6 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 and Holyoake regions 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 the transition of the mine from Huntly to Myara North and Holyoake and a 5% increase in production at the Pinjarra refinery. The process also seeks to modernize aspects of the regulatory framework for the Huntly mine.

3.7 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.

4.0 ACCESSIBILITY, CLIMATE, LOCAL RESOURCES, INFRASTRUCTURE AND PHYSIOGRAPHY

4.1 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 Willowdale Road, a sealed single carriageway road to the south 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.

4.2 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.

4.3 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.

4.4 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 151.
- 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.

4.5 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.

5.0 HISTORY

5.1 Prior Ownership

Prior to 1961, there were no records of ownership of the Darling Range mines. A Special Mineral Lease (ML1SA) was granted to Western Aluminum NL (WANL) in 1961. In the same year WANL joined Aluminum Company of America Ltd (Alcoa US). In 1977 WANL became Alcoa.

5.2 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 analyzing 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.Al2O3. 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).

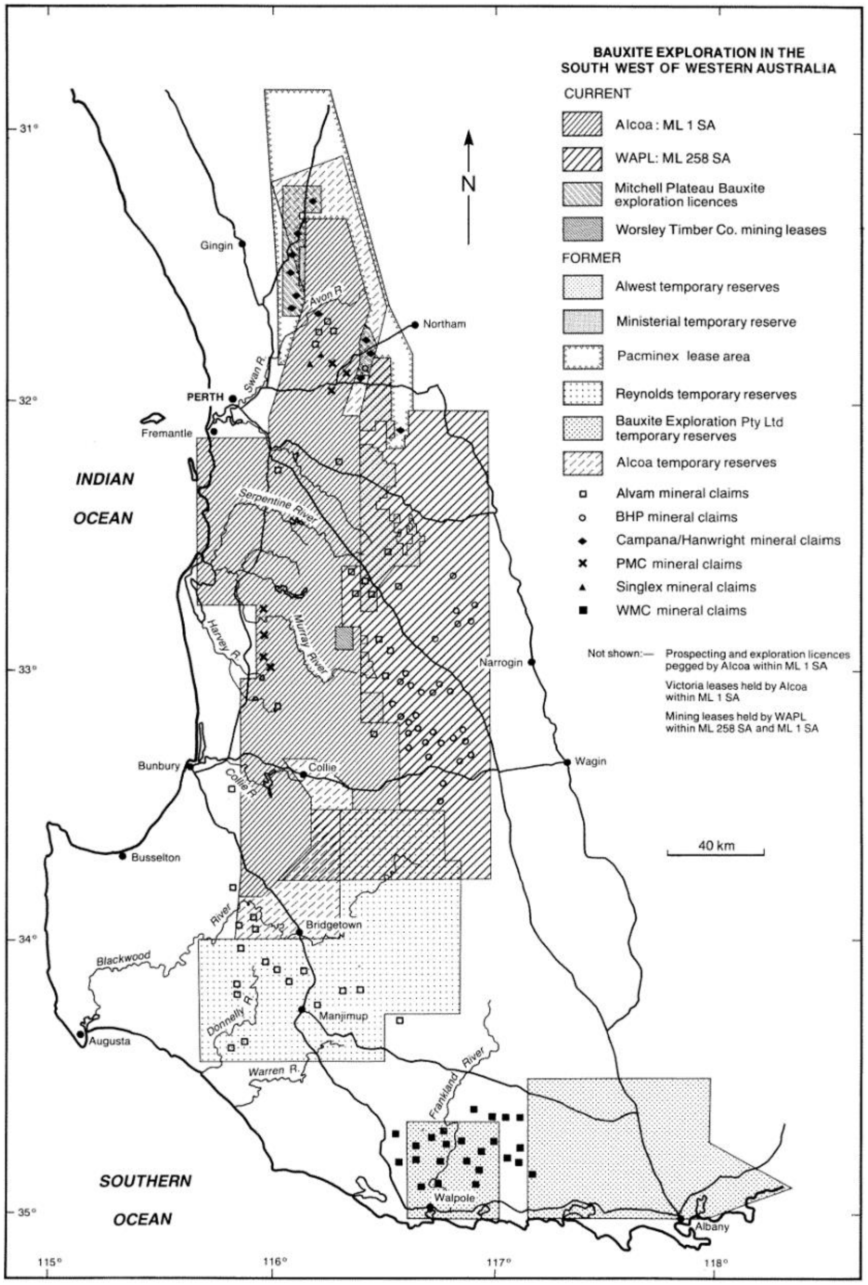


Figure 5-1: Bauxite Exploration in the Southwest of Western Australia 1961 (adapted from Hickman, 1992)

6.0 GEOLOGICAL SETTING, MINERALIZATION, AND DEPOSIT

6.1 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 approximately 60 years as of 2022.

6.2 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.

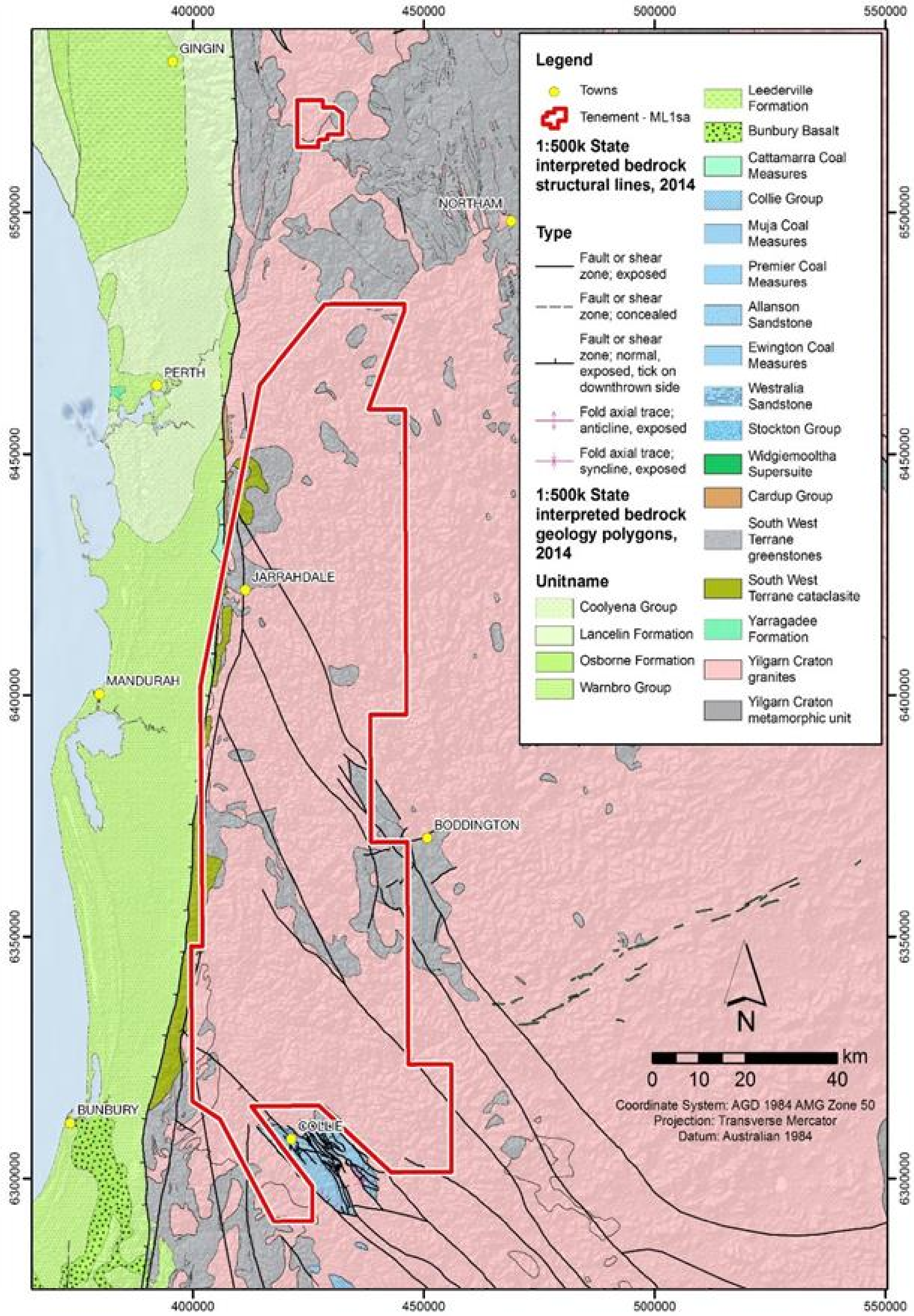


Figure 6-1: Regional Geology (adapted from SRK, 2021)

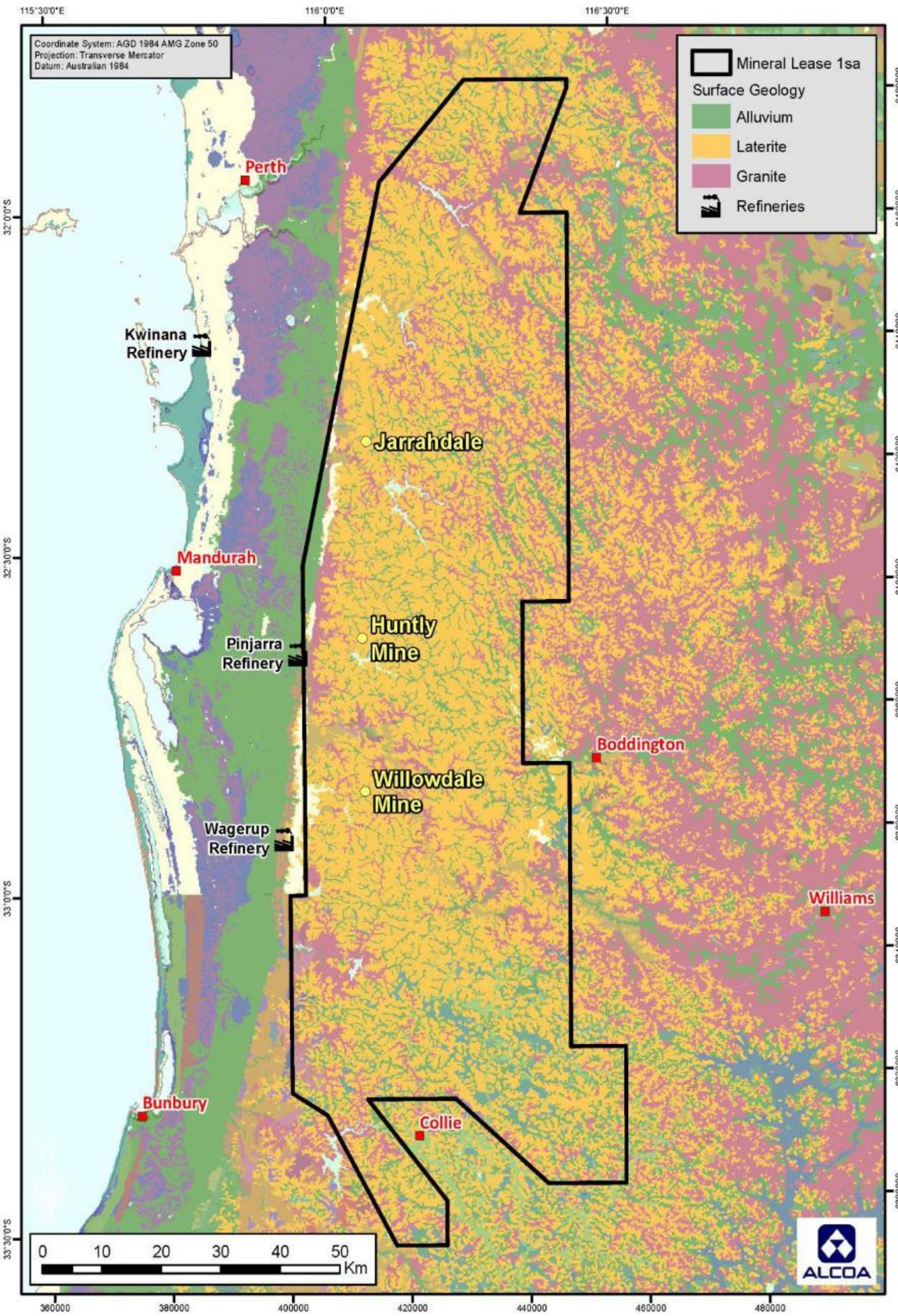


Figure 6-2: Surface Geology Showing Laterite Over Granite (Alcoa, 2015)

6.3 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 (3° 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.

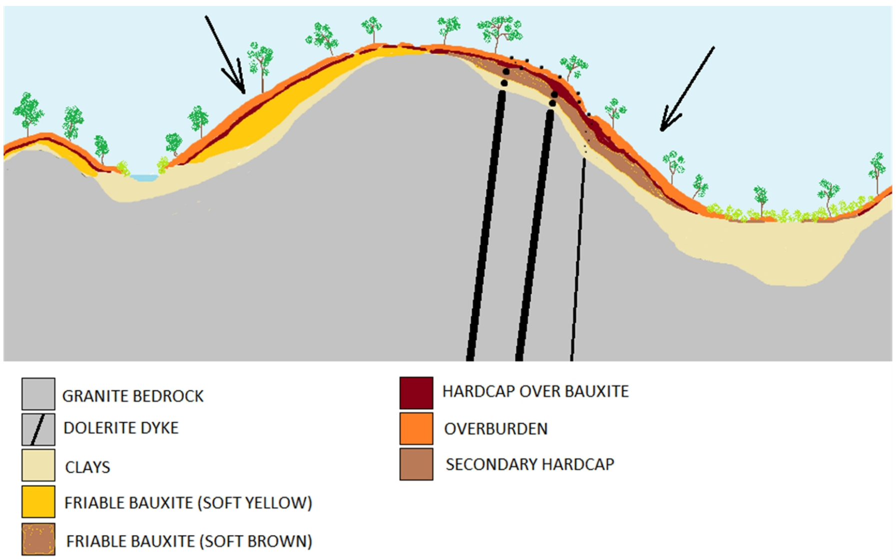


Figure 6-3: Bauxite Deposit Formation Schematic – Relief Exaggerated (Alcoa, 2021)

6.4 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 Fe2O3, 9% quartz SiO2, 1% kaolinite/halloysite Al2Si2O5(OH)4, and 0.5% anatase/rutile TiO2.

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.

6.5 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	-

Area	Description (m)	Overburden	Hardcap	Friable Zone	Basal Clay
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	-

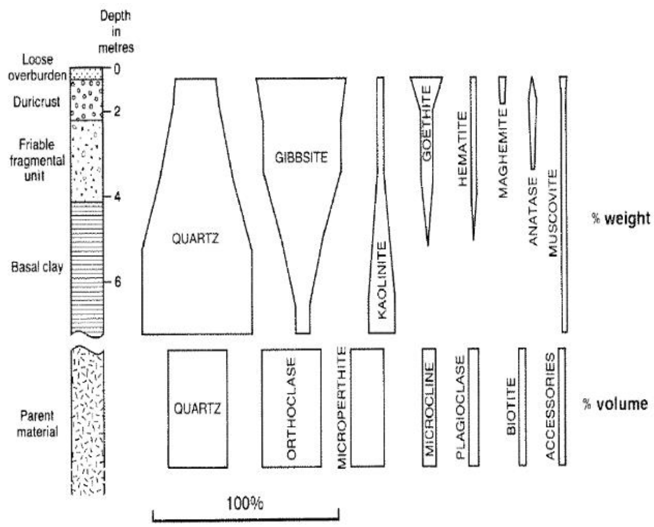


Figure 6-4: Typical Alcoa Darling Range Mineralogy Profile (Hickman et al, 1992)

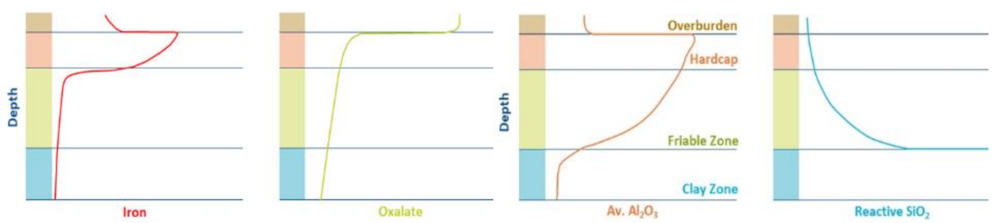


Figure 6-5: Typical Alcoa Darling Range Grade Profile (Alcoa, 2015)

Typical photos of the bauxite profile in current mining areas observed on 14 October 2021 are provided in Figure 6-6.

Left: Vegetation cleared prior to mining. Right: Top soil and oxalate removed leaving Hardcap

Left: Blastholes on Hardcap after sheeting with low grade. Right: Hardcap (hard brown) Friable (soft yellow), relict fresh remnant Dolerite dyke boulder

Sandy topsoil, Hardcap (hard brown), Friable (soft yellow), Basal Clay (white clay, lower right in the floor).

Figure 6-6: Typical Alcoa Darling Range Mining Sequence and Vertical Profile (SLR, 2021)

7.0 EXPLORATION

7.1 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 Al2O3 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.

7.2 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).

A total of 332,017 holes were used to the resource estimate, and theses holes were drilled between 1981 to 2022, 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	656			656	5,574			5,574	10,415			10,415
1983	199			199	1,090			1,090	1,899			1,899
1984	995			995	7,083			7,083	12,119			12,119
1985	393			393	2,815			2,815	4,971			4,971
1990	13			13	58			58	101			101
1991	2,900		1,073	3,973	16,145		8,335	24,480	28,170		15,066	43,236
1992	6,169		1,512	7,681	34,156		10,868	45,024	59,442		19,632	79,074
1993	2,264		546	2,810	13,022		3,502	16,525	22,723		6,424	29,147
1994	6,527	632	1,168	8,327	36,032	4,019	6,453	46,504	62,083	7,103	11,224	80,410
1995	4,354	79	1,843	6,276	25,841	477	10,543	36,861	45,064	871	19,021	64,956
1996	4,673	336	641	5,650	26,196	1,522	4,025	31,743	45,771	2,667	7,300	55,738
1997	808		2,908	3,716	4,868		18,422	23,290	8,603		33,146	41,749
1998	7		835	842	61		5,149	5,209	111		9,339	9,450
1999	18		906	924	137		4,325	4,462	239		7,603	7,842
2000	22		174	196	187		1,022	1,210	344		1,852	2,196
2001	538		317	855	4,893		2,087	6,980	9,038		3,805	12,843
2002	1,104		252	1,356	9,187		1,440	10,627	16,789		2,551	19,340
2003	287		1,221	1,508	1,973		8,032	10,005	3,557		14,727	18,284
2004			272	272			1,413	1,413			2,569	2,569
2005	783		1,641	2,424	5,655		9,588	15,243	10,248		17,503	27,751
2006	1,357		508	1,865	9,815		3,212	13,027	18,090		5,936	24,026
2007	4,241		2,832	7,073	29,312		19,353	48,665	53,795		35,473	89,268
2008	2,975		739	3,714	18,299		4,524	22,823	32,639		8,101	40,740

Year	Holes				Meters				Assay			
	Huntly	North	Willowdale	Total	Huntly	North	Willowdale	Total	Huntly	North	Willowdale	Total
2009	4,468		324	4,792	25,928		1,901	27,829	45,870		3,451	49,321
2010	9,027		1,568	10,595	52,706		10,755	63,460	92,198		19,778	111,976
2011	10,072		925	10,997	54,908		6,404	61,313	95,665		11,696	107,361
2012	10,507		1,198	11,705	59,552		9,352	68,903	103,654		17,326	120,980
2013	11,656		2,629	14,285	69,457		21,002	90,459	121,176		38,816	159,992
2014	8,977		9,406	18,383	50,588		64,736	115,324	88,452		119,187	207,639
2015	14,737		9,987	24,724	82,480		61,418	143,897	144,552		111,469	256,021
2016	14,738		330	15,068	88,714		1,737	90,451	156,269		3,019	159,288
2017	7,245		6,317	13,562	39,253		37,467	76,720	68,540		66,311	134,851
2018	11,027		10,596	21,623	59,764		55,857	115,620	105,317		98,614	203,931
2019	15,437		10,949	26,386	89,967		72,144	162,111	158,019		129,773	287,792
2020	22,487		16,278	38,765	118,632		102,516	221,147	206,952		184,609	391,561
2021	19,418		12,677	32,095	123,602		96,872	220,474	218,276		176,705	394,981
2022	19,637		7,682	27,319	120,056		57,600	177,656	214,432		104,561	318,993
Total	**220,716**	**1,047**	**110,254**	**332,017**	**1,288,008**	**6,018**	**722,050**	**2,016,076**	**2,265,582**	**10,641**	**1,306,587**	**3,582,810**

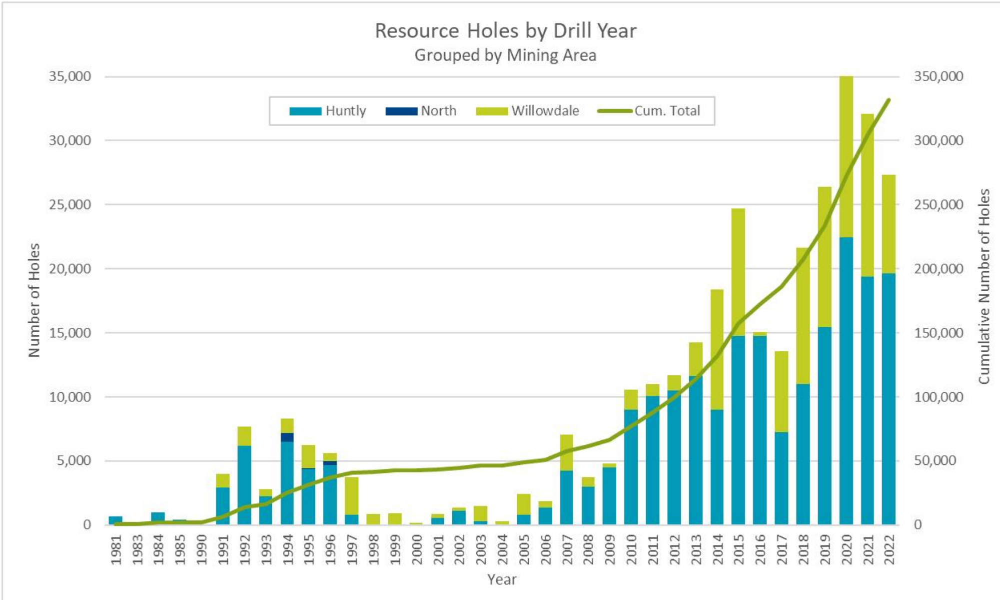


Figure 7-1: Chart of Resource Drill Holes by Year (Alcoa, 2022)

The Darling Range deposits contain more than three million drillholes distributed across a lease of over 7,000 km², 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 mineralization, rather than in Exploration mode, looking for new, broader targets. 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:

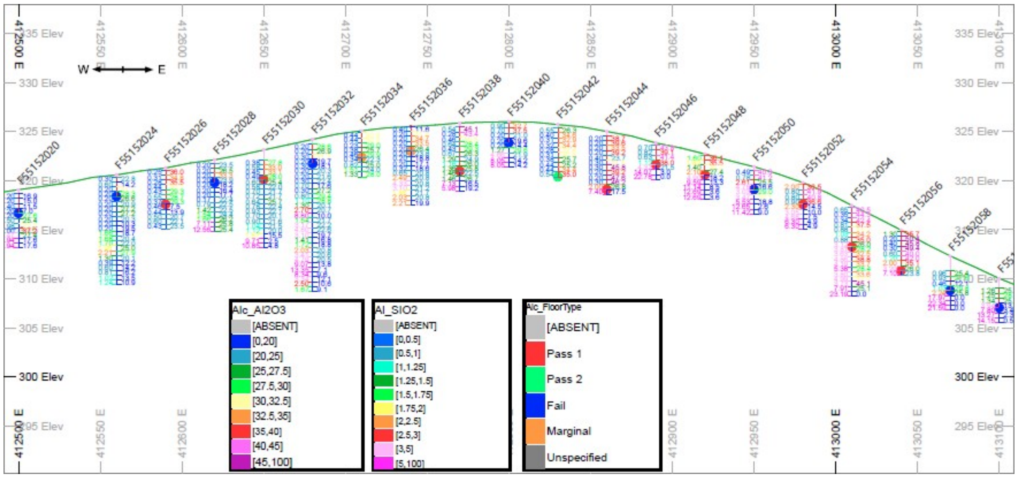


Figure 7-2: Example Geological Section – F55 N 6,325,500 (SRK, 2021)

7.3 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 dispatch. 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 2022 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 center 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 center 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

7.4 Drill Sampling

7.4.1 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 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 dispatch 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)

7.4.2 Recording Sampling Data

The drill hole and sample information are 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)

7.4.3 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
GR	Granite	
WET	Wet	Other
ROD	Broken rod	

7.5 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.

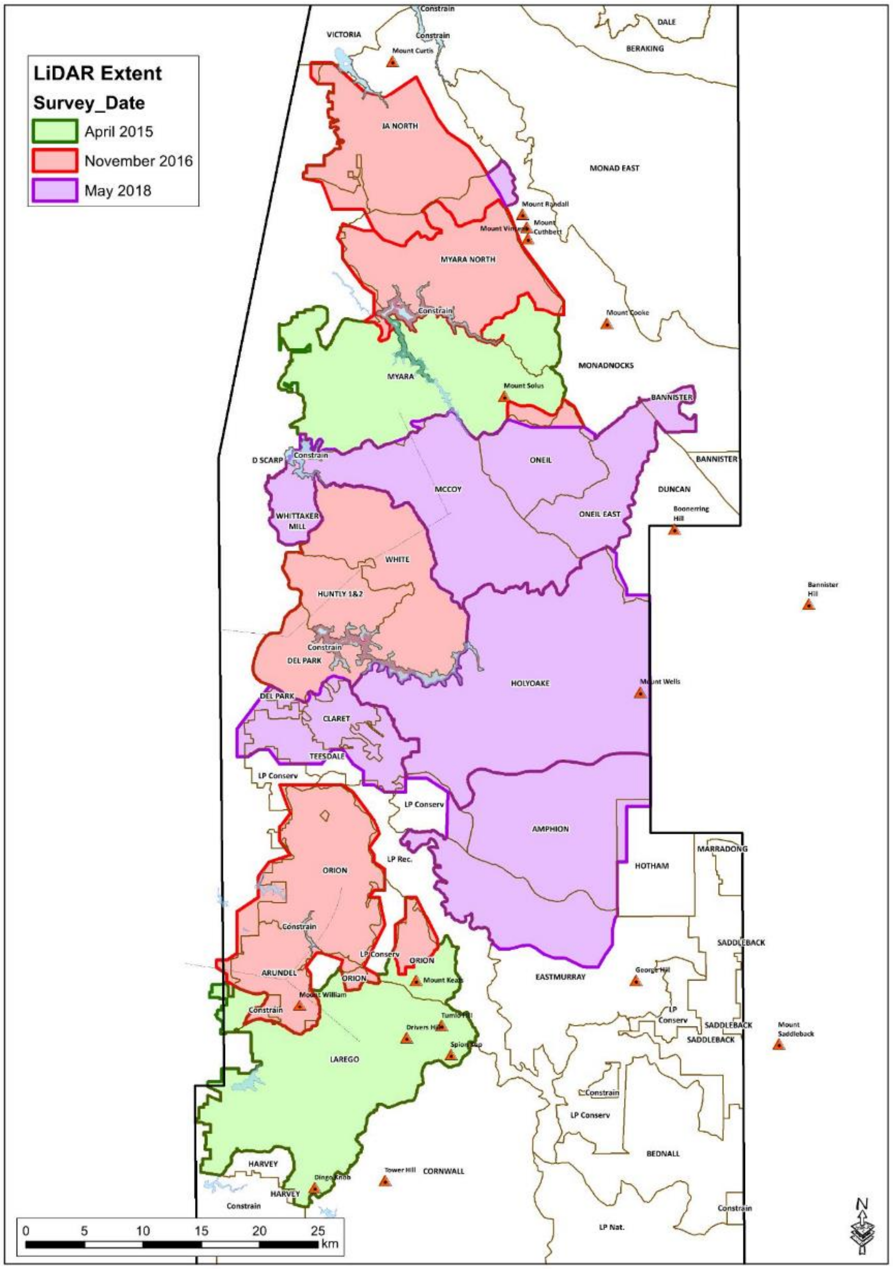


Figure 7-7: Topographic Data Coverage of the 2015, 2016 and 2018 LiDAR Surveys (Alcoa, 2022)

7.6 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.

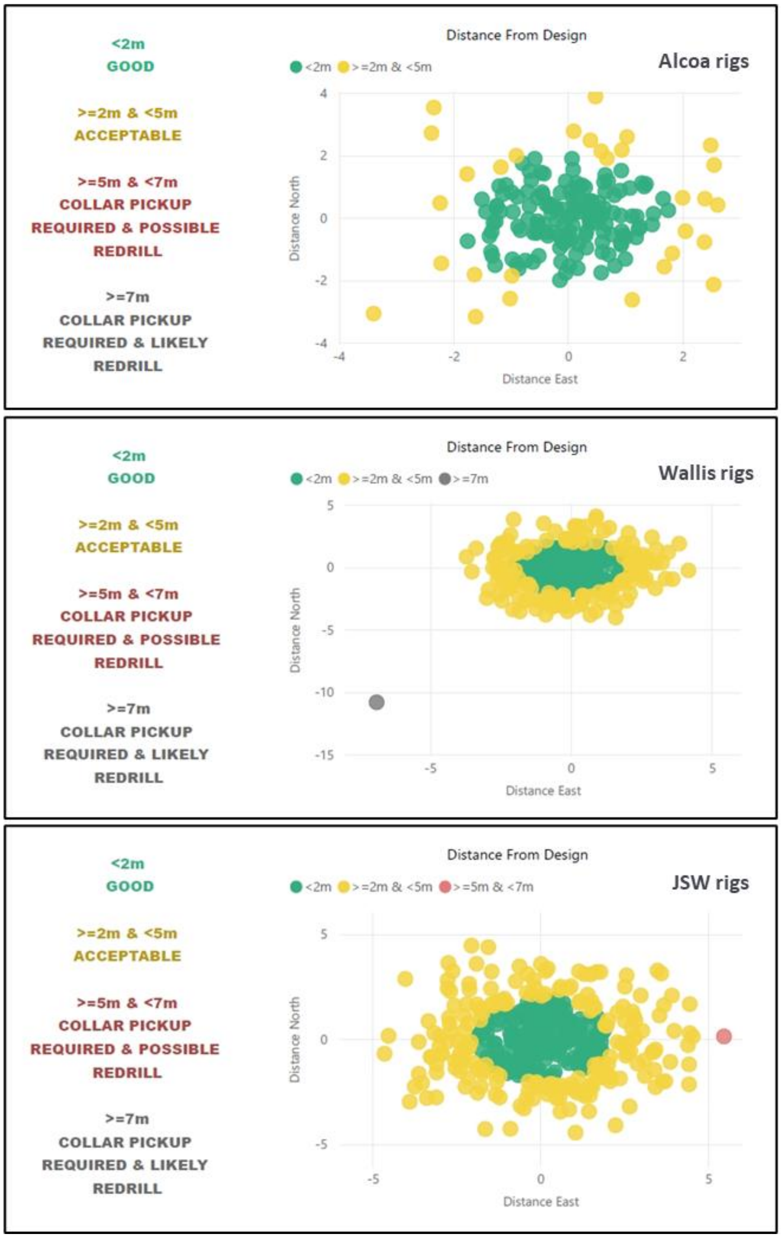


Figure 7-8: Error in Actual Collar Location from the Nominal (planned) Position is Monitored for the Three Drill Rig Types (Alcoa, 2021)

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).

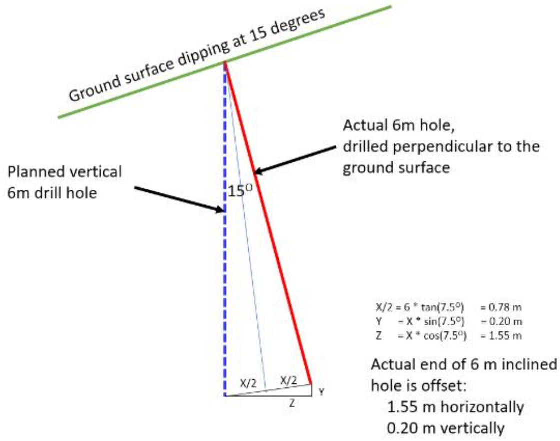


Figure 7-9: Possible Lateral and Vertical Sample Location Error on 15° Sloping Ground (SLR, 2021)

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).

7.7 Sampling Conclusions

In the 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.

7.8 Hydrogeology Data

Historically, no site-specific hydrogeological data was available on the basis that no hydrogeological considerations are required for the definition of mining plans in Alcoa's Darling Range operations. However, extension of mining activities into the proposed Myara North and Holyoake development envelopes was recently considered to potentially pose a risk to the multiple uses of groundwater in the area including drinking water production, timber harvesting, pine plantation and recreation.

Alcoa has collected groundwater level and groundwater quality data within the Myara North mine region since the 1970s, with available groundwater data typically concentrated within the eastern areas of the mine region. In contrast, only limited water level and water quality data had been obtained within the Holyoake mine area. As part of the 2020 to 2021 baseline monitoring program, the monitoring network and program was expanded to include:

- 18 new groundwater bores at 16 locations within the Myara North mine region, to supplement 25 existing Alcoa groundwater bores. Two sites included installation of a shallow and deep paired bores, providing data on groundwater for the upper 'perched' unit and the underlying more regional groundwater.

- 17 new groundwater monitoring bores were installed in 2020 within the Holyoake mine region, to supplement 8 existing Alcoa groundwater bores.

- The baseline groundwater monitoring program comprised monthly water level dips and physico-chemical parameter measurements from October 2020, with groundwater samples collected for laboratory analysis of a broader suite of parameters in October 2020 and February 2021.

In consideration of the data obtained from the expanded monitoring network, several hydrogeologic and hydrologic investigations were undertaken by GHD Pty Ltd (GHD) throughout 2021 and into 2022, including:

- Implementation of a baseline surface and groundwater monitoring program including installation of a monitoring network

- Groundwater modelling for Myara North and Holyoake mine regions

- Drinking water risk assessment for Serpentine, Serpentine Pipehead, South Dandalup and Wungong Brook catchments.

The results of these investigations will be assessed as part of the Pinjarra Alumina Refinery Revised Proposal (Assessment No. 2253), which includes the Huntly Bauxite Mine transition to Myara North and Holyoake (See Section 17.1.2).

7.9 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.

8.0 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. Bella 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.

8.1 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 dispatched by courier to the Bella assay facility at the Kwinana Refinery.

8.2 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. Pulverized samples are stored in a barcoded dedicated receptacle for assay (Figure 8-2).

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.

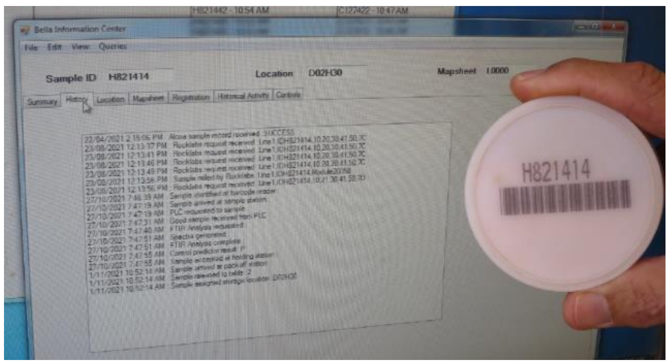


Figure 8-3: The Pulverized Sample is Tracked Digitally Through the Bella Preparation and Assaying (SLR, 2021)

Grind size monitoring is carried out with the advantage of the robotic sample preparation being consistent grind size. 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 8.4.2.

Quality control (QC) procedures were developed and implemented to monitor the Bella robotic sample preparation system (Franklin, 2019) and they 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 97.9°C 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 8-4).

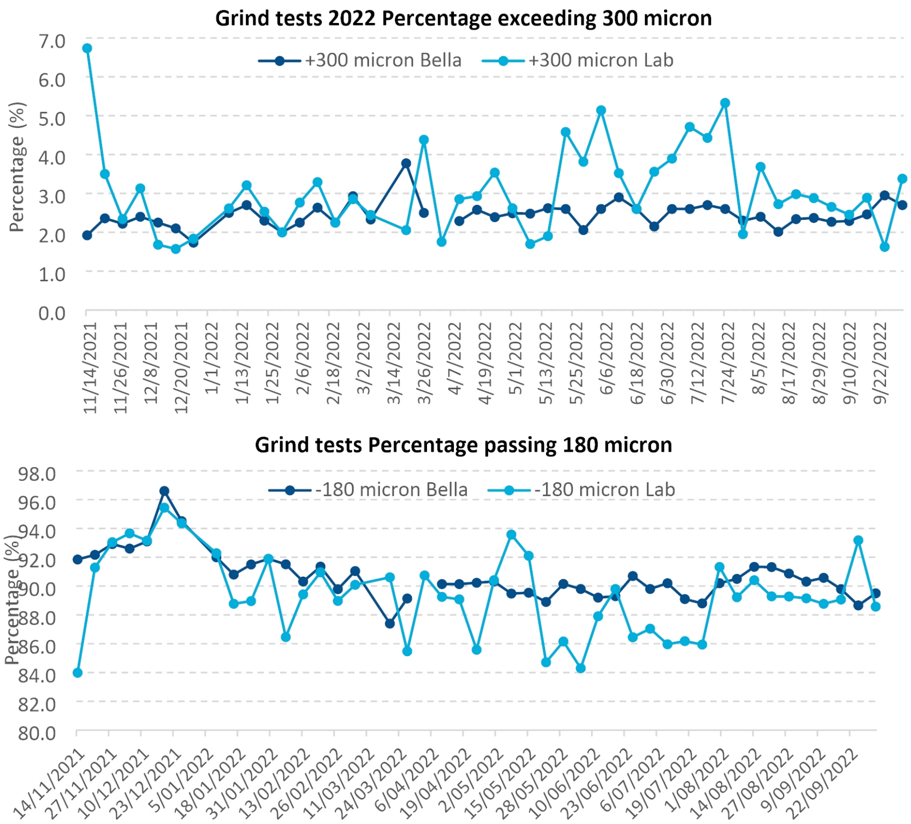


Figure 8-4: Sample Preparation Monitoring: Grind Sizes for the Robotic Sample Preparation Unit Tested by Bella and by KWI (Alcoa, 2022)

8.3 Assaying

Assaying of the drill samples is based on a spectral method, using a Nicolet 6700 FTIR Spectrometer with a robotic feeder (Figure 8-5). 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.

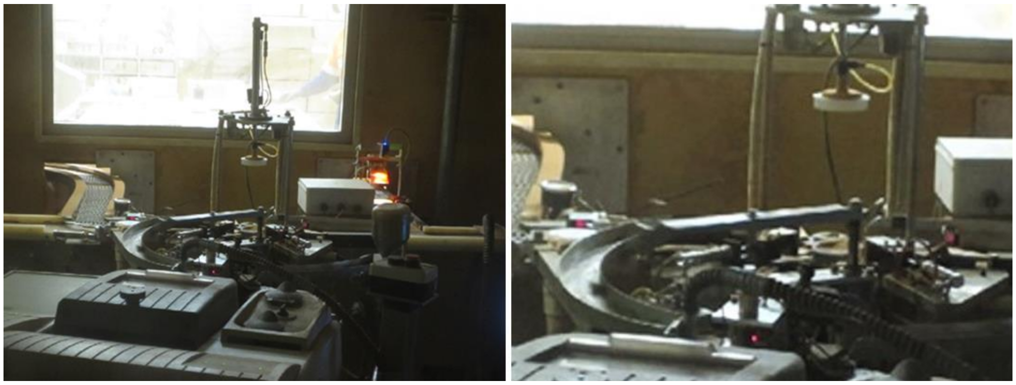


Figure 8-5: The Robotic FTIR Assaying Equipment
(RHS shows the sampling scoop arm and pulp dish with the lid elevated) (SLR, 2021)

8.3.1 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.SiO2) 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).

8.3.2 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.

8.3.2.1 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.Al2O3	AL	%	MD – ICP (MALSI)
Reactive Silica	R.SiO2	SI	%	MD – ICP (MALSI)
Total Iron	Fe2O3	FE	%	XRF and FTIR
Oxalate	Na2C2O4	OX	kg/t	BD – GC
Carbonate	Na2C2O3	CO	kg/t	BD – NDIR (TICTOC)
Extractable Organic Carbon	C	EO	kg/t	BD – NDIR (TICTOC)
Total Phosphorous	P2O5	PT	%	XRF
Sulphate	Na2SO4	SU	kg/t	XRF

Name	Analyte	Code	Units	Reference Method
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 8-6):

- 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 8-6: 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.

Since completion of the 2021 Mineral Resource inventory, an additional 56,825 vacuum and aircore holes have been drilled and approximately 640,000 routine FTIR analyses performed. These represent holes drilled between September 2021 and June 2022.

8.4 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 Mineral 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 drilling samples.

8.4.1 QA/QC Protocols

The following QA/QC protocols are implemented and managed by Alcoa's team, and QA/QC samples are not blind to the laboratory, with the exception of STE samples. Batches of samples are submitted to the Bella laboratory daily. Internal standards created from the stockpile of the Darling Range bauxite are introduced by the Bella Laboratory every 50 samples during the FTIR analysis to check the chain of process. All standard sample insertions and batches maintain consecutive numerical order. Calibration is done at first to generate the reference mean of the standard as well as the acceptable minimum and maximum values totaling three standard deviations.

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 (1%). These are submitted to the KWI in batches of 19 for REF assaying to calibrate and validate the quality of the FTIR Bella 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. Each batch of REF samples includes 1 Blank and 1 Standard. The REF samples are considered to serve the same purpose as pulp repeats in defining the repeatability of the assays. Alcoa also sends checks of REF samples assayed at Bella and KWI to an independent laboratory, Bureau Veritas (BV).

Alcoa introduced in 2018 an alternative procedure to field duplicates, termed Sample To Extinction (STE). 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.

Following receipt of results from the laboratories, Alcoa geologists review the values, and sample batches identified as anomalous are repeated by the laboratory. QA/QC reports are produced monthly upon receiving new results. The QP recommends the preparation of quarterly and yearly QA/QC reports to track possible issues that might arise over time.

The following are the existing written QA/QC procedures available to all staff:

- 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, collection of further FTIR calibration and validation (CalVal) samples, 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.

QP reviewed QA/QC information compiled in the previous report (SLR, 2022) and analyzed the new QA/QC data compiled by Alcoa between February 2021 and October 2022. The results of this analysis are summarized in the following sub-sections.

8.4.2 Blanks

Blanks are not routinely introduced in FTIR submission batches 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. There is also no available blank sample on the market that would not introduce contamination of the mills by very low-grade samples at Bella. KWI laboratory submits blanks with a frequency of 1 to 19 in the REF samples sets compiled and dispatched regularly by Bella, however that information was not available for review.

8.4.3 Standards

Standards evaluate accuracy of the assaying by detecting the differences between a result and an expected value, also known as a bias. 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. Between 2021 and 2022, only IRM KH14 and KH20 have been used at the Bella Laboratory and KH10 at the mining laboratory. 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. The IRMs have not been externally certified. A summary of the IRMs is provided in Table 8-2.

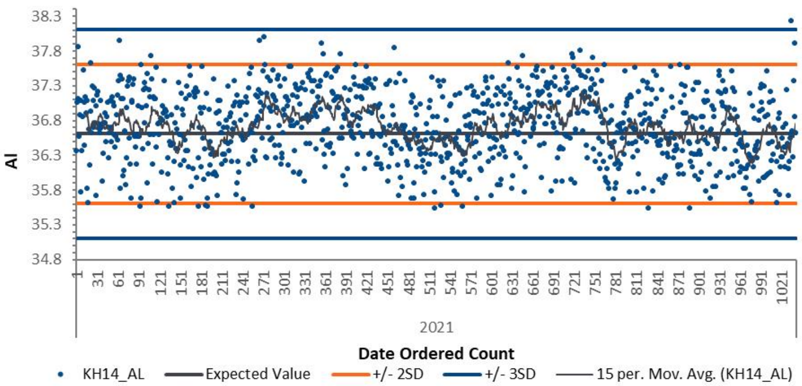
Table 8-2: Standards Used for Drilling and REF Monitoring (IRMs)

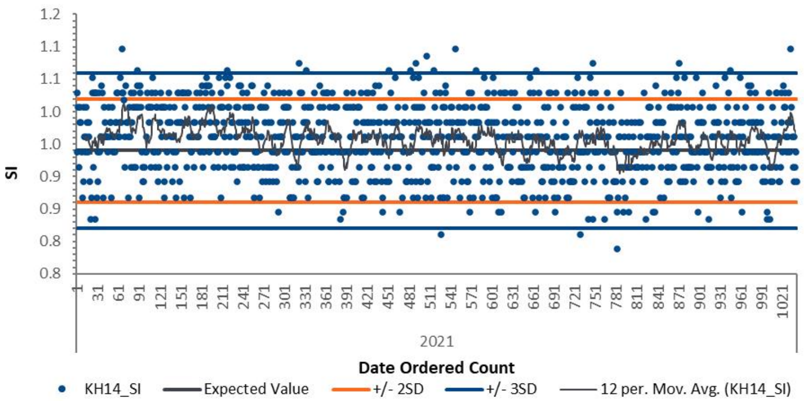
Standard	Date	Comment
KH09	May 1999 to present	Boehmite analysis, FTIR, MD-ICP, and XRF analysis Mining reference analysis (IRM)
KH10	May 2012 to present	Mining reference analysis (IRM)
KH11	July 2008 to March 2015	FTIR analysis (IRM)
KH12	July 2008 to April 2014	Grind size control (IRM)
KH13	April 2014 to present	Grind size control (IRM)
KH14	March 2015 to October 2021	FTIR analysis (IRM)
KH15	October 2015 to September 2017	Preparation and analytical control – introduced at the drill rig (IRM)
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)
KH20	October 2021 to present	FTIR analysis (IRM)

Control of the accuracy of FTIR samples is currently monitored at the Bella laboratory using IRMs KH14 and KH20. The IRMs are inserted every 50 FTIR samples. FTIR batches totaling 21,983 samples of KH14 and KH20 analyzed between February 2021 to October 2022 and using Priority Codes P177 to P193 were sent to SLR for review. Priority Codes represent batches assayed by the FTIR Method using the same batch correction factors.

The QP selected six batches; three to review KH14 and three for KH20. The QP prepared control charts for available Al, reactive Si and Fe and analyzed temporal and grade trends, reviewed the data for low and high biases, and the failure rate of each standard. The failure rate was defined as a value reporting more than three standard deviations (SD) from the expected value.

Results of Alcoa's KH14 for batches P177, P179 and P181 were reviewed. Available Al (A.Al2O3) results are well behaved, have a very low failure rate (0.09% in batch P181 only) and present no bias. The plotted values of A.Al2O3 of KH14 from batch P181 can be visualized in Figure 8-7. Conversely, reactive Si (R.SiO2) presents either a high or a low bias, with a failure rate ranging between 0.25% to 1.92%. Temporal trends are also distinguishable in P177 and P181. Results of R.SiO2 from batch P181 are also presented in Figure 8-7. The analysis of KH14 Fe2O3 results show variability by showing some high biases, a local temporal trend and a failure rate located between 0% and 1.15% (P181). The Fe2O3 values of batch P181 are too pictured in Figure 8-7. Values of A.Al2O3 for KH14 reviewed ranged between 35.86% and 36.61%, which is comparable to the extents of the average grade of the deposit. The values of R.SiO2 were also similar to the average grade of the deposit, ranging between 0.91% and 0.94%. The overall take on the analysis of KH14 indicates a relatively good and consistent precision at the laboratory. The QP recommends investigating these local biases with the Bella Laboratory.





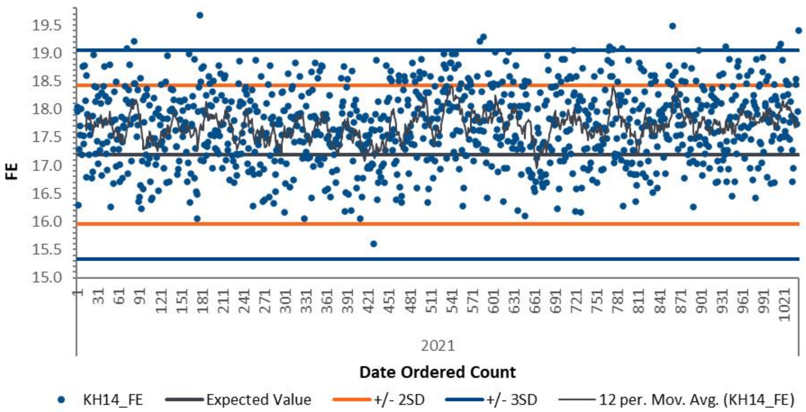
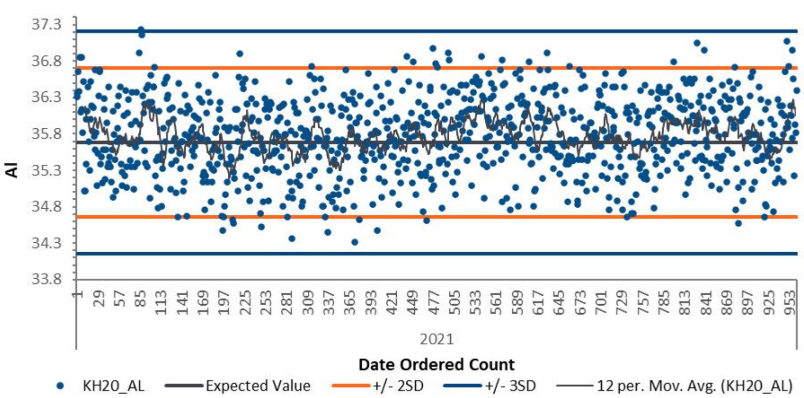


Figure 8-7: KH14 Control Chart of AL, SI and Fe from Batch P181

Batches P183, P186 and P191 were examined for standards KH20. Its A.Al2O3 expected values in percent are between 33.14% and 35.68% while R.SiO2 range between 1.00% and 1.09%. For Fe2O3, the average expected results are between 15.16% and 16.07%. This standard is representative of the average grades of the deposit. The control charts for KH20 of batch P183 is shown in Figure 8-8. Overall, A.Al2O3 values are generally well behaved and are found between the acceptable low and high limits of three SD, with the exception of one sample in batch P183 and P191, causing low failure rates ranging between 0.07% and 0.1%. Results for R.SiO2 indicates generally good accuracy at the Bella Laboratory. A failure rate between 0.7% and 2.47% was observed for batch P183 and P186, respectively, and there are temporal low grade biases in all batches reviewed. All Fe2O3 samples returned values within the three SD range, and only one batch (P191) showed values mostly distributed below the mean after the first quarter, possibly indicating a low bias. The QP recommends investigating the bias observed to ensure that economic areas are not incorrectly excluded from the Mineral Resource domains.



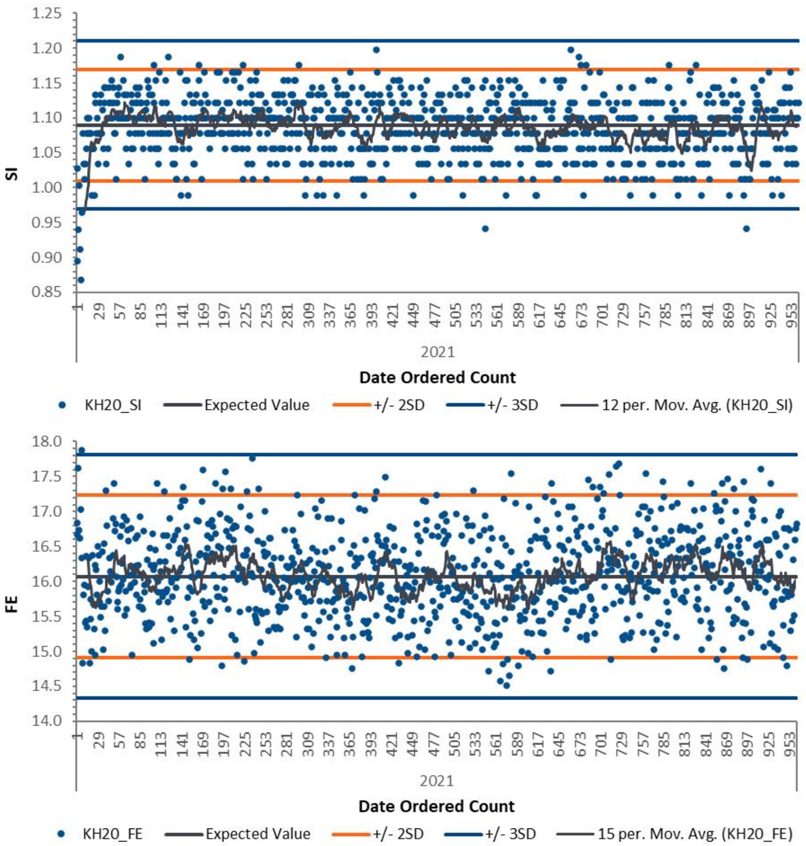


Figure 8-8: KH20 Control Chart of AL, SI and Fe from Batch P183

The frequency of insertion of IRMs at the mining laboratory of standard KH10 is 1 in every 19 samples (one REF batch). 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.

The QP selected three batches, P184, P188 and P193, to examine the values of A.Al2O3, R.SiO2 and Fe2O3 analytes in KH10 standards used in 2021 and 2022 for additional review. KH10 expected values are close to the average grade of the deposit. Results from the analyte A.Al2O3 of standard KH10 from the three revised batches indicate mostly good laboratory accuracy and precision. No failure was observed although a slight low bias was distinguished in P188.

Standards performance overall is excellent for Al, good for Fe and generally reasonable for Si analytes.

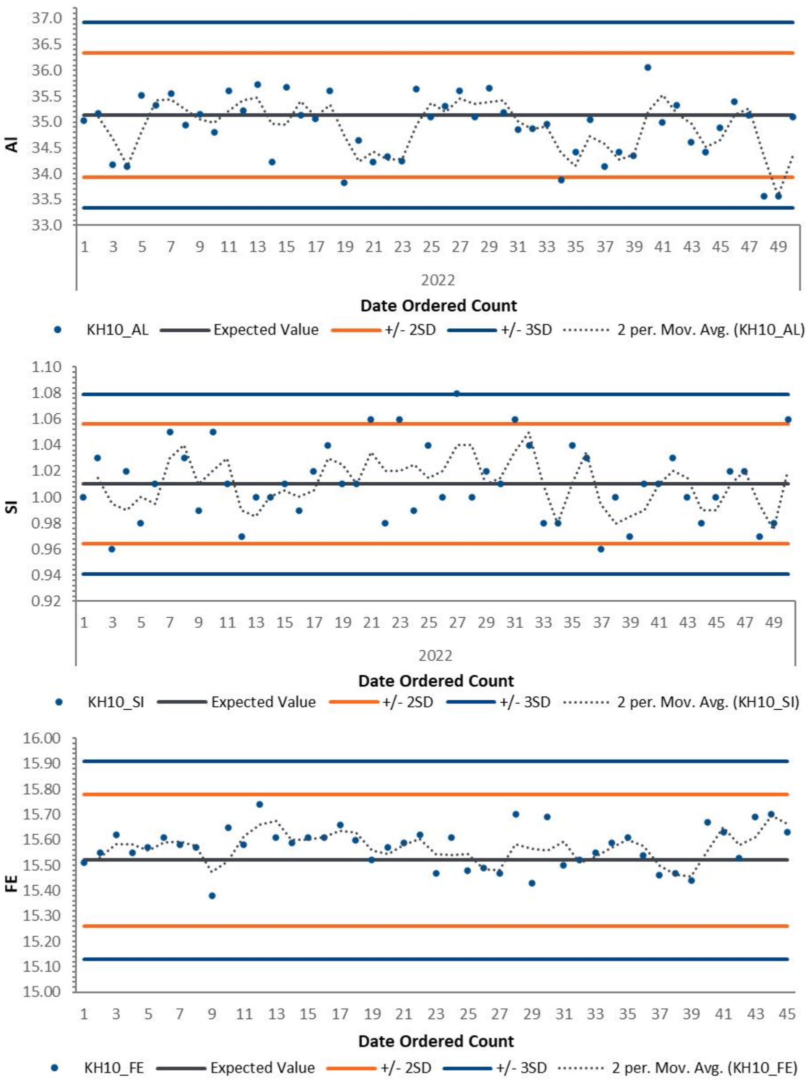


Figure 8-9: KH10 Control Chart of AL, SI and Fe from Batch P188

Historically, from October 2015 to December 2018, 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.

8.4.4 Duplicates

8.4.4.1 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 45º 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 correlation coefficient.
- 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.

8.4.4.2 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 re-splitting all of the reject a second time). Alcoa discontinued the routine collection of field duplicates in January 2018 due to limitations to the benefit of collecting field duplicates because the sample splitting procedure was problematic (SLR, 2022). Therefore, no additional data is currently available to review for field duplicates. The process was superseded by the Sample to Extinction process, described in Section 8.4.4.5.

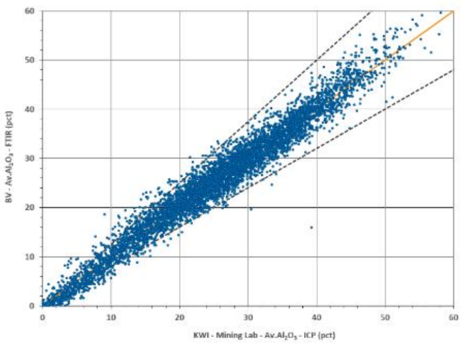
8.4.4.3 Check Assays - Umpire Laboratory Checks

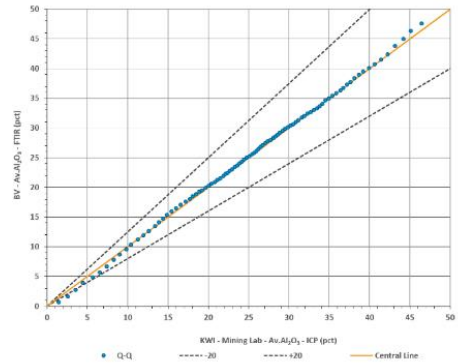
Alcoa sends checks of REF samples assayed at the KWI to an independent laboratory, Bureau Veritas Minerals (BV) in Canning Vale, Western Australia for an impartial review. BV holds NATA accreditation No.626 and it is accredited for compliance with ISO/IEC 17025 – Testing. SLR was handed out a spreadsheet to examine with a total of 6,284 samples that covered the original Bella and REF values as well as the results from the analytes re-assay by FTIR at BV. Results from the REF comparison with BV can be visualized in the form of scatter plots and quantile-quantile plots in Figure 8-10, Figure 8-11 and Figure 8-12 for A.Al2O3, R.SiO2 and Fe2O3 respectively. The associated method of analysis for each REF analytes are listed in Section 8.3.2.1.

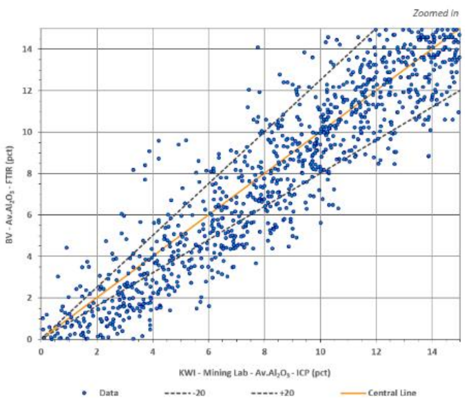
It is apparent that there is a bias with the Alcoa KWI reporting higher for AL, notably for values found between 0% and 10% AL. Statistics indicate an overall good repeatability at Bureau Veritas with a correlation coefficient of 0.984 for 6,284 pairs. Results for SI are similar, with a low bias for Bureau Veritas at grades between 0.7% and 1.2%. The tendency changes for grades between 2% and 6% where a slight high bias is observed with the BV values. The correlation coefficient for SI is excellent, at 0.989 for 6,284 pairs. KWI REF Fe_2O_3 values between grades of 0-2.5% are reporting lower, but generally presents an excellent correlation with a coefficient of 0.985 for 6,253 pairs.

Given the good repeatability of the REF assays from KWI, the precision can be considered higher than expected, especially knowing that the KWI laboratory analytical method is better customized to the Alcoa bauxite than the umpire laboratories.

Scatter Plot – A.Al2O3	Quantile-Quantile Plot – A.Al2O3



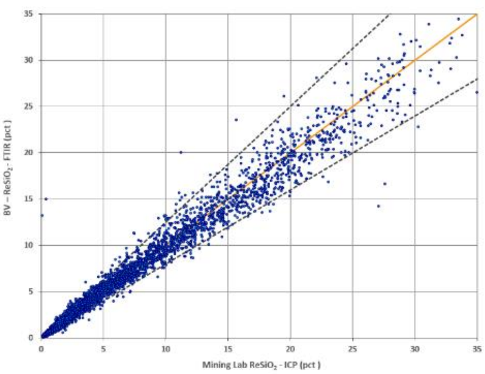


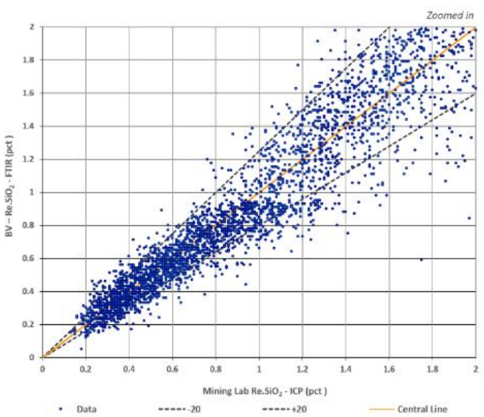


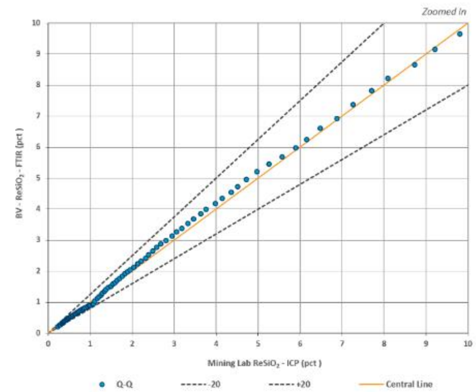
	Original	Duplicate
Number of Samples (N):	6,284	6,284
Mean (%):	23.65	23.81
Maximum Value (%):	58.20	62.84
Minimum Value (%):	- 6.51	- 1.67
Median (%):	24.76	25.01
Variance:	159.43	163.79
Std. Dev:	12.63	12.80
Co-ef. Variation:	0.53	0.54
Correlation Coefficient	0.984	
% Difference Between Means	-0.7%	

Figure 8-10: Scatter Plot, Quantile-Quantile Plot and Statistics of AL Umpire Laboratory Checks – KWI Mining Lab and Bureau Veritas

Scatter Plot – R.SiO2	Quantile-Quantile Plot – R.SiO2



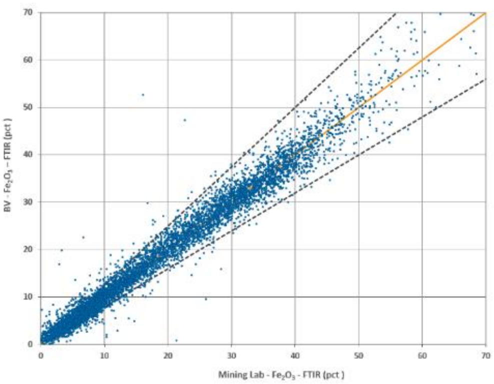


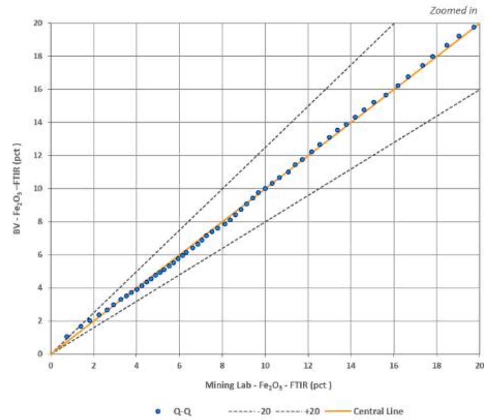


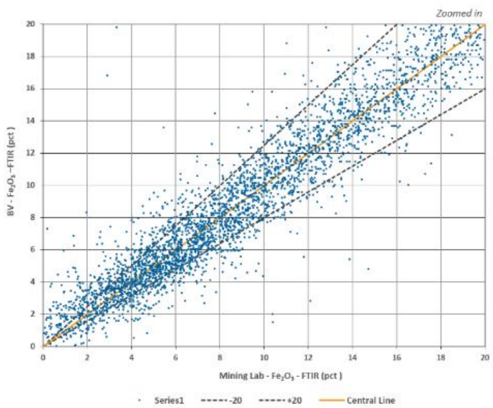
	Original	Duplicate
Number of Samples (N):	6,284	6,284
Mean (%):	4.87	4.83
Maximum Value (%):	38.50	40.72
Minimum Value (%):	0.10	0.05
Median (%):	2.04	2.12
Variance:	39.44	37.14
Std. Dev:	6.28	6.09
Co-ef. Variation:	1.29	1.26
Correlation Coefficient	0.989	
% Difference Between Means	0.8%	

Figure 8-11: Scatter Plot, Quantile-Quantile Plot and Statistics of SI Umpire Laboratory Checks – KWI Mining Lab and Bureau Veritas

Scatter Plot – Fe2O3	Quantile-Quantile Plot – Fe2O3





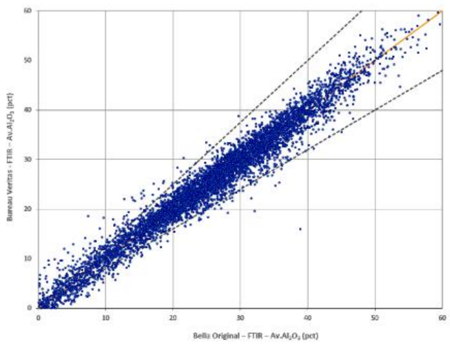


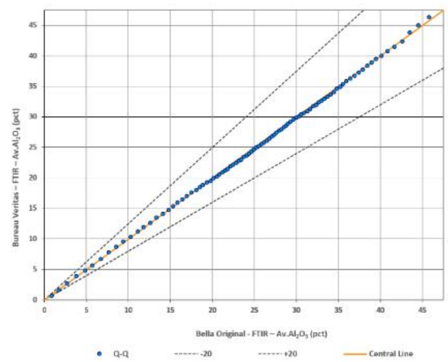
	Original	Duplicate
Number of Samples (N):	6,253	6,253
Mean (%):	19.35	19.32
Maximum Value (%):	75.80	74.87
Minimum Value (%):	-1.59	-1.55
Median (%):	16.18	16.23
Variance:	189.19	188.70
Std. Dev:	13.75	13.74
Co-ef. Variation:	0.71	0.71
Correlation Coefficient	0.985	
% Difference Between Means	0.2%	

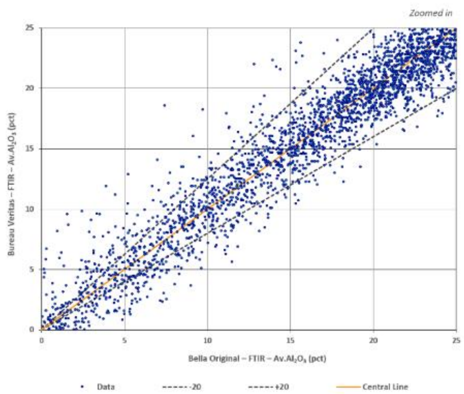
Figure 8-12: Scatter Plot, Quantile-Quantile Plot and Statistics of FE Umpire Laboratory Checks – KWI Mining Lab and Bureau Veritas

A similar comparison was also done between Bella original sample results and Bureau Veritas on A.Al2O3, R.SiO2 and Fe2O3 analytes and the outcomes are shown in Figure 8-13 to Figure 8-15. Results for A.Al2O3 present a slight low bias for the Bureau Veritas values below 2%, however the analysis shows an overall great correlation and precision between the two data set, especially with grade above 20%. The Quantile-Quantile plot suggests great grade correspondence between the original value and its checked value at BV. The coefficient of correlation is 0.985 for 6,280 pairs. The analysis of R.SiO2 showed a few acceptable biases across the population. Bureau Veritas is reporting slightly higher values between 0-0.4%, marginally lower from 0.6% to 1.2% and slightly higher between 1.5% and 5%. Another minor low bias for values above 10% is observable, but overall, the correlation is good which is reflected by a correlation coefficient of 0.989 for 6,280 pairs assessed. The results of Fe2O3 demonstrated a good correlation, with a coefficient of 0.986 and no discernible bias. The Fe2O3 values showed that the precision is better above 10%.

Scatter Plot – A.Al2O3	Quantile-Quantile Plot – A.Al2O3



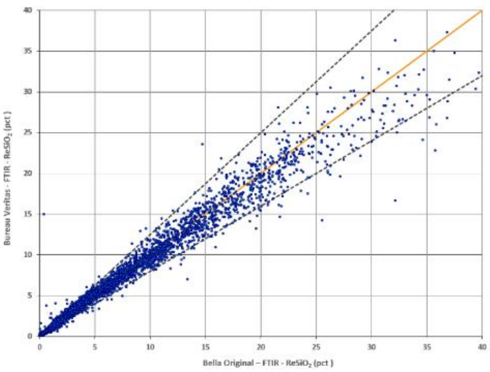


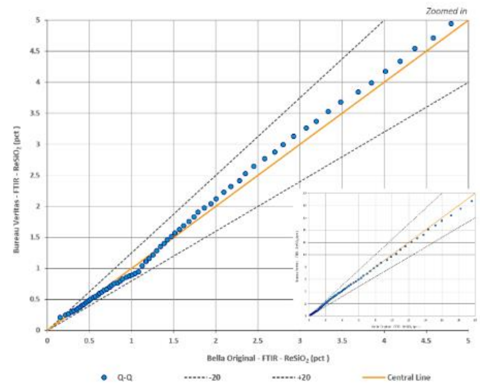


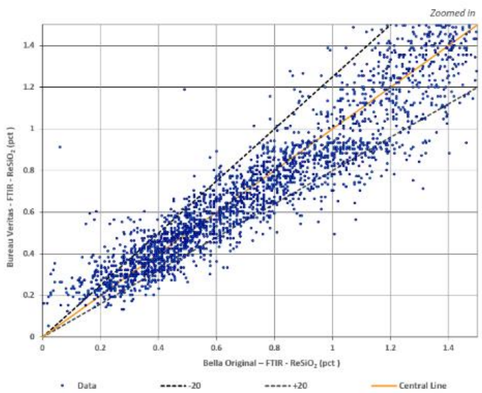
	Original	Duplicate
Number of Samples (N):	6,280	6,280
Mean (%):	23.91	23.81
Maximum Value (%):	61.89	62.84
Minimum Value (%):	-2.08	-1.67
Median (%):	25.20	25.01
Variance:	164.11	163.81
Std. Dev:	12.81	12.80
Co-ef. Variation:	0.54	0.54
Correlation Coefficient	0.985	
% Difference Between Means	0.4%	

Figure 8-13: Scatter Plot, Quantile-Quantile Plot and Statistics of AL Umpire Laboratory Checks – Bella and Bureau Veritas

Scatter Plot – R.SiO2	Quantile-Quantile Plot – R.SiO2



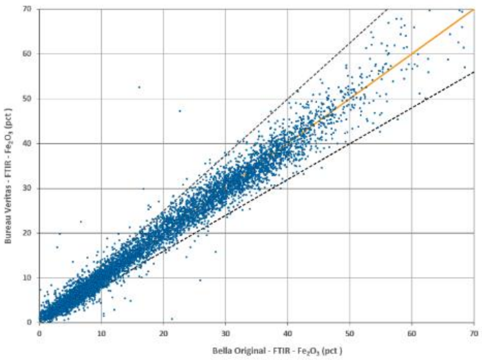


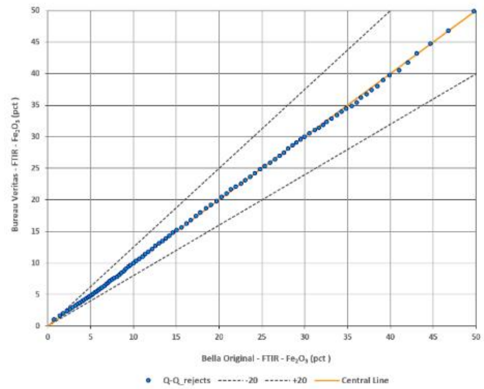


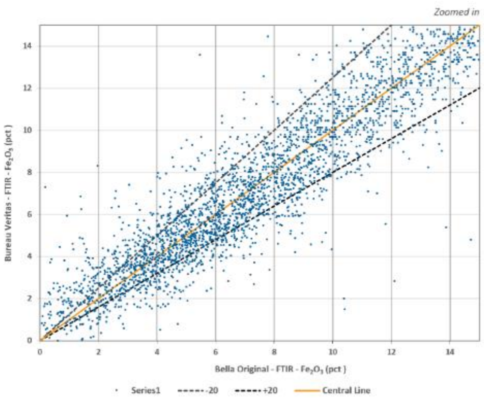
	Original	Duplicate
Number of Samples (N):	6,280	6,280
Mean (%):	4.92	4.83
Maximum Value (%):	41.56	40.72
Minimum Value (%):	- 0.11	0.05
Median (%):	2.00	2.13
Variance:	41.51	37.15
Std. Dev:	6.44	6.09
Co-ef. Variation:	1.31	1.26
Correlation Coefficient	0.989	
% Difference Between Means	1.8%	

Figure 8-14: Scatter Plot, Quantile-Quantile Plot and Statistics of SI Umpire Laboratory Checks – Bella and Bureau Veritas

Scatter Plot – Fe2O3	Quantile-Quantile Plot – Fe2O3







	Original	Duplicate
Number of Samples (N):	6,280	6,280
Mean (%):	19.34	19.31
Maximum Value (%):	75.80	74.87
Minimum Value (%):	-1.59	-1.55
Median (%):	16.17	16.23
Variance:	189.26	188.79
Std. Dev:	13.76	13.74
Co-ef. Variation:	0.71	0.71
Number of Samples (N):	0.986	
% Difference Between Means	0.2%	

Figure 8-15: Scatter Plot, Quantile-Quantile Plot and Statistics of FE Umpire Laboratory Checks – Bella and Bureau Veritas

8.4.4.4 Twinned Hole Studies

Since the last report (SLR, 2022), the twin hole studies campaign has been suspended because of its limited value and therefore, no additional data is available for an updated analysis.

8.4.4.5 Sample To Extinction (STE) Samples

After a few reviews of the data sets between 2018 and 2021 by independent consultants, biases and poor repeatability were reported. The issue was investigated, and it 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.

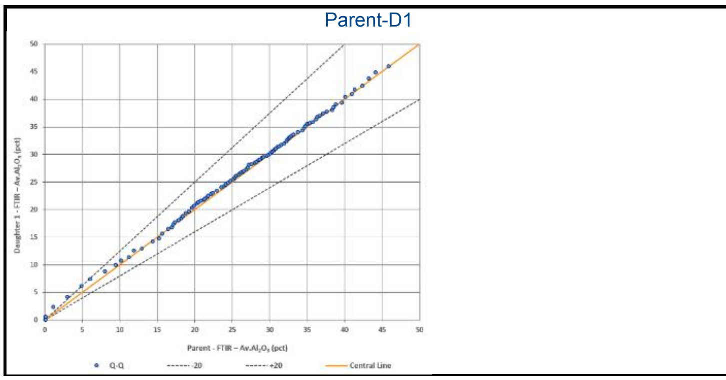
Since 2020, Alcoa refined the STE sampling procedure to now collect one sample per shift from each drill rig and assay three Daughters after pulverizing and splitting. The 2022 STE clean dataset examined by SLR contained results for 550 pairs. SLR has used this data set to prepare bivariate statistics, scatter plots and precision plots.

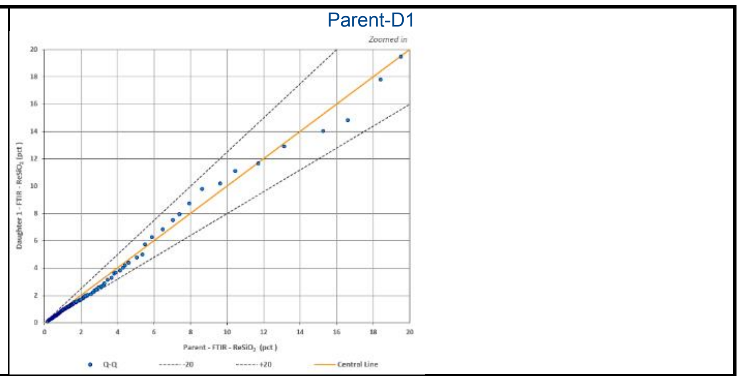
Comparisons were carried out for the analytes AL, SI, and FE between:

- Daughter 1 vs the Parent
- Daughter 2 vs the Parent
- Daughter 3 vs the Parent
- Daughter 2 vs Daughter 1
- The average of the Daughters vs the Parent

Studies of the Parent-Daughter sets showed good repeatability for the residue pulp repeats (i.e. between the Daughters) even though the correlation coefficients were relatively low, ranging between 0.921 and 0.948. The daughter values show statistical consistency with the parent, which indicates acceptable pulverizing and correct splitting of the residue offsite. The daughter analyte Al is showing higher values, or a high bias, for the three set of daughters. The biases are mostly observed at grades between 0-8% and values are more scattered in general between 0-5%. Correlation coefficient for A.Al2O3 for Daughter one (D1) is 0.937, Daughter two(D2) is 0.929 and Daughter three(D3) is 0.921. Results for R.SiO2 show an alternance of low and high bias, the first low bias ranging from 0-5%, the slight high bias from 5% to 12% and the last low bias from 12-45%. The correlation coefficient is also in the same bracket, varying between 0.93 and 0.94. As for the results of Fe2O3, a low bias was identified for each parent-daughter set but is most prominent between 0 and 10-15%. The correlation coefficients varied between 0.935 and 0.948. Examples are provided in Figure 8-16 for A.Al2O3, and R.SiO2.

As expected, similar repeatability with the individual daughter analysis was reported between the residue results (the average of the Daughters) and the normal drill sample (the Parent), with comparable bias suggestions. It is therefore reasonable to say that 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.





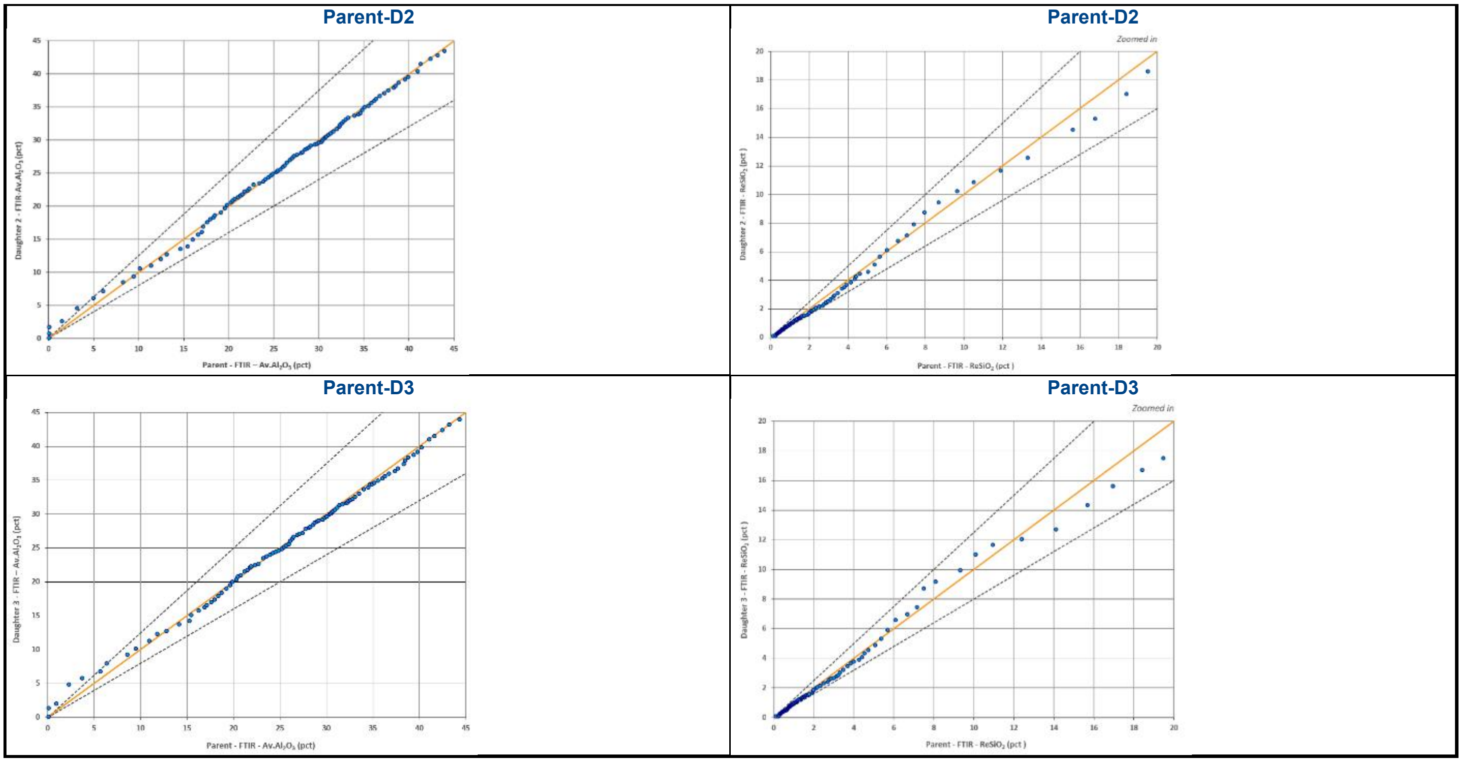


Figure 8-16: Quantile-Quantile Plot of Parent and Individual Daughters' Analysis of A.Al2O3 (on the left) and of R.SiO2 (on the right)

While the STE procedure could be retained for specific studies, in the QP's opinion, the reintroduction of field duplicates using appropriate riffle splitters under supervision should be considered.

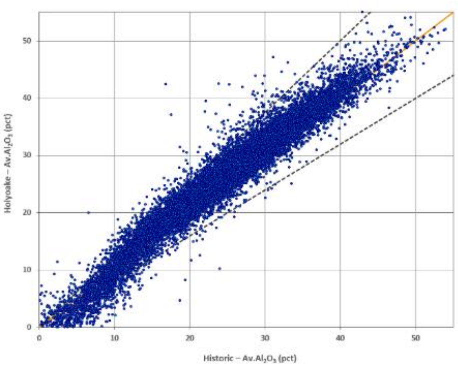
8.4.4.6 Holyoake Program

Submitting historic assays to be re-evaluated is a method that helps monitor the quality of the historical data to guide daily production. A set of 33,224 historic and recent assays was provided to SLR, which was cleaned up to produce a total of 15,412 perfectly match pairs. The QP prepared an analysis which included a comparison of the original historic FTIR Al and SI assay and recent Holyoake duplicate assay results. Alcoa implemented the Holyoake check assay in 2021.

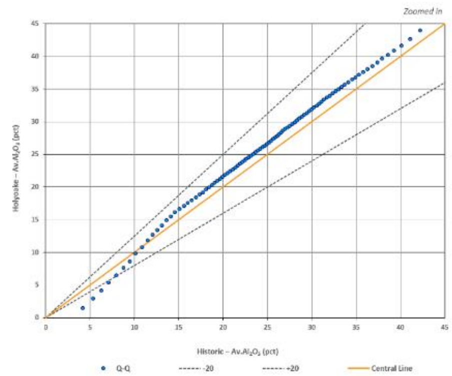
The large pool of samples facilitated the interpretation of accuracy and precision. The analysis of both AL historic versus Holyoake results indicates clearly that recent values are higher above 10% in grade, confirming a clear high bias. Below 10%, the values are lower, showing a low bias, and mostly outside the acceptable limit of 20% difference. Both affirmations can be visualized in Figure 8-17. Values of SI are behaving similarly, as observed in Figure 8-18, with a low bias between grade of 0 and 5%, and a strong high bias for values above 5%. The percent difference between the means are quite high for both analytes, at 5.3% for Al and 13.5% for SI.

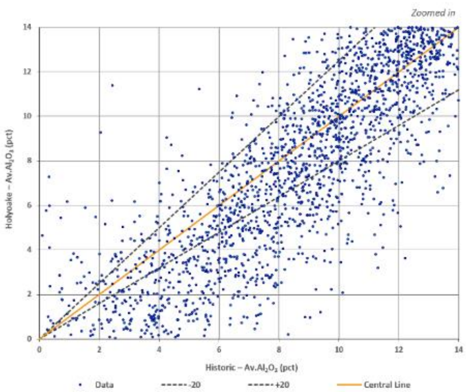
These differences can be the results of an improvement of the analysis method and procedure since 2005 reflecting a better geochemical understanding of the deposit. The QP recommends addressing these biases by limiting the use of historic data when possible and continuing the re-assay program of assays collected before 2005.

Scatter Plot – A.Al2O3



Quantile-Quantile Plot – A.Al2O3

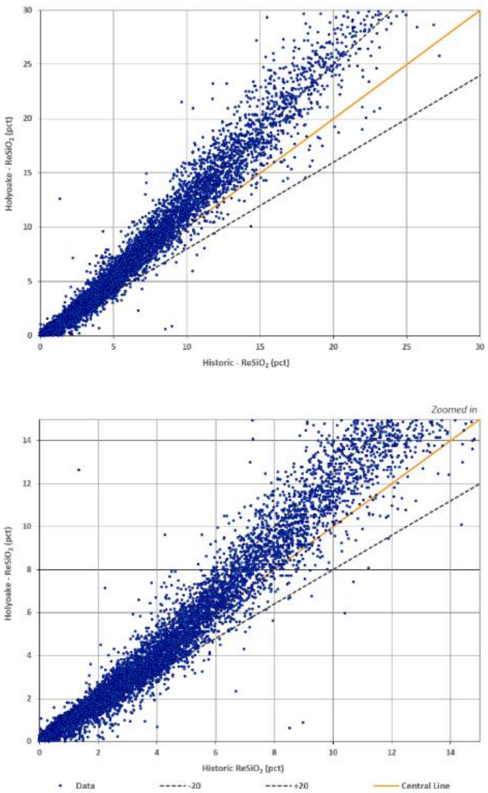


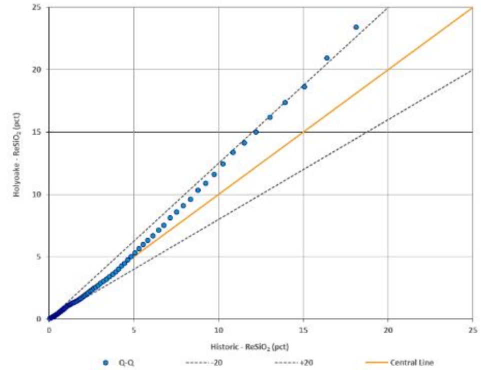


	Original	Duplicate
Number of Samples (N):	15,412	15,412
Mean (%):	23.71	24.96
Maximum Value (%):	59.00	58.60
Minimum Value (%):	-4.09	-2.08
Median (%):	24.46	26.10
Variance:	101.39	120.83
Std. Dev:	10.07	10.99
Co-ef. Variation:	0.42	0.44
Correlation Coefficient	0.975	
%Difference Between Means	-5.3%	

Figure 8-17: Scatter Plot, Quantile-Quantile Plot and Statistics of AL Historic and Holyoake Results

Scatter Plot – R.SiO2	Quantile-Quantile Plot – R.SiO2





	Original	Duplicate
Number of Samples (N):	15,412	15,412
Mean (%):	3.65	4.14
Maximum Value (%):	34.55	42.96
Minimum Value (%):	-0.92	-0.13
Median (%):	1.64	1.48
Variance:	21.37	34.71
Std. Dev:	4.62	5.89
Co-ef. Variation:	1.27	1.42
Correlation Coefficient	0.987	
% Difference Between Means	-13.5%	

Figure 8-18: Scatter Plot, Quantile-Quantile Plot and Statistics of AL Historic and Holyoake Results

8.4.4.7 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.

A comparison of these paired samples (SLR, 2022) found no material issues and no new data was presented for this review.

8.5 Conclusions

It is the QPs opinion that the large data sets collected over a long timeframe, the satisfactory mine production shown by reconciliation results (see Section 11.12), and the QC data sets examined, all provide sufficient confidence in the available data for resource estimation.

Specifically:

- Sampling, preparation, and analyses are appropriate for the style of mineralization and are sufficient to support Mineral Resources.
- Sample and data security are consistent with industry best practices.
- There are potential biases in both reactive silica and available alumina analytical results of the check assays but given the overall decent repeatability of the REF and original FTIR assays at Bureau Veritas, the precision can be considered higher than expected, especially knowing that the KWI and Bella laboratory analytical method is better customized to the Alcoa bauxite than the umpire laboratories.
- Both available alumina and reactive silica present some minor biases in the analysis of the internal reference material (standards), while failure rates a very low and Fe is generally better behaved. Additional analysis is required to confirm these biases.
- Analytes reviewed for the Holyoake program results show poor precision between the historic and recent assay analysis.
- The STE method is as good a representation of the drill interval grade as collecting the whole of the residue and carrying out pulverizing, homogenization and splitting.

It is the opinion of the 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 Sections 8.3 and 8.4.

It is the opinion of the QP from the studies on FTIR repeatability discussed above that the overall precision and accuracy of the FTIR assaying is acceptable.

In the QP's opinion, the QA/QC program as designed and implemented by Alcoa is adequate and the assay results within the database are suitable for use in a Mineral Resource estimate.

9.0 DATA VERIFICATION

9.1 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 prioritize 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 dispatched, 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)

9.2 Data Verification Measures

The 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 9-1.

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.

9.3 QP Opinion

The database extracts that were provided proved very robust to scrutiny, except 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 QP is of the opinion that the database is adequate, and the data is appropriate for the purpose of Mineral Resource estimation.

10.0 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 2021 for the Willowdale operation and 2010 to 2020 for the Huntly operations[1] indicates that the product from the Darling Range operations consisted of an average Al2O3 grade of 33% and average SiO2 grade of 20%. It is important to note that higher grades of reactive SiO2 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 SiO2 content on an annual average basis remains below 20%, and that reactive SiO2, 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)

[1] 2022 operating data was not available for the Huntly operation at the time of the report.

Year	Moisture (%)	LOI (%)	Total Al2O3 (%)	Total SiO2 (%)	Fe2O3 (%)	TiO2 (%)	A.Al2O3 (%)	R.SiO2 (%)
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
2021	8.296	21.52	37.53	17.95	21.03	1.728	32.37	1.061
2022	7.815	21.13	37.45	17.94	21.31	1.846	32.29	1.018

Table 10-2: Product Grades of Darling Range Operations (Huntly–Pinjarra refinery feed)

Year	Moisture (%)	LOI (%)	Total Al2O3 (%)	Total SiO2 (%)	Fe2O3 (%)	TiO2 (%)	A.Al2O3 (%)	R.SiO2 (%)
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
2021	8.9	21.1	38.8	19.7	18.3	1.48	33.0	1.24
2022	8.5	20.8	37.9	19.3	19.9	1.62	31.9	1.31

Table 10-3: Product Grades of Darling Range Operations (Huntly– Kwinana refinery feed)

Year	Moisture (%)	LOI (%)	Total Al2O3 (%)	Total SiO2 (%)	Fe2O3 (%)	TiO2 (%)	A.Al2O3 (%)	R.SiO2 (%)
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
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

Year	Moisture (%)	LOI (%)	Total Al2O3 (%)	Total SiO2 (%)	Fe2O3 (%)	TiO2 (%)	A.Al2O3 (%)	R.SiO2 (%)
2021	8.9	21.0	38.7	20.9	17.6	1.39	33.0	1.20
2022	8.5	20.8	37.6	20.7	18.6	1.50	31.9	1.26

10.1 QP Opinion

SLR is of the opinion that the Darling Range operation demonstrates that ore can be effectively crushed and supplied to a refinery for further upgrading to produce Alumina. The historical operational data confirms that the ore consistently meets 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.

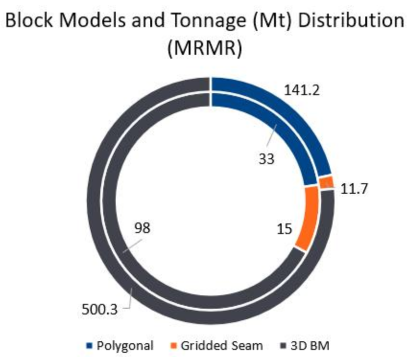
11.0 MINERAL RESOURCE ESTIMATES

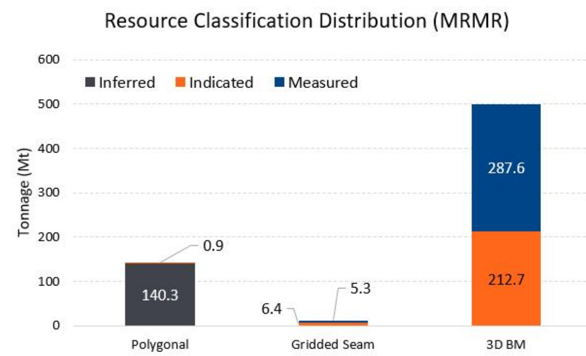
11.1 Summary

The Darling Range resource comprises over 13,000 resource blocks, with a combined area of approximately 10,870 ha, averaging 50 kt of Mineral Resource per block. 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 approximately 76% of the total tonnage, including Mineral Resources and Mineral Reserves (MRMR), of the Darling Range project is already in 3D block models. GSM models were typically constructed in areas with 15 m spaced drilling, which comprises 10 models. Approximately 60% 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.

Figure 11-1 illustrates the tonnages and number of models for each model type that are being discussed in this section.





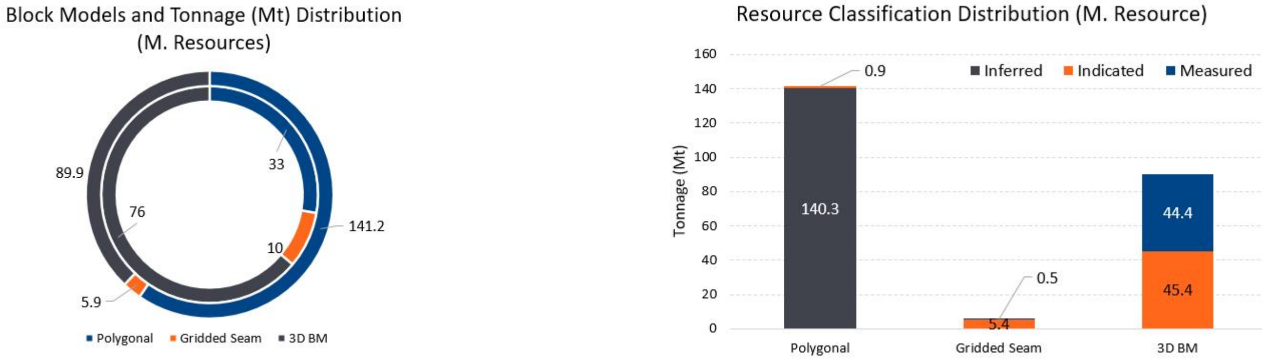


Figure 11-1: Circle Charts Showing the Tonnage (external circle) and Number of Models (internal Circle) and Bar Charts Showing the Tonnage by Mineral Resource Categories. Charts on the Top Refer to all the Tonnage of the Darling Range Project, and on the Bottom to the Exclusive Mineral Resources

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 QP 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 Institute of Mining Metallurgy and Petroleum (CIM) (2014) definitions in NI 43-101 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 Darling Range deposit 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 Darling Range Mineral Resources exclusive of Mineral Reserves – 31st December 2022

Category	Tonnage (Mt)	A.Al2O3 (%)	R.SiO2 (%)
Measured	44.9	31.17	1.15
Indicated	51.8	31.40	1.17
Measured + Indicated	**96.7**	**31.29**	**1.16**
Inferred	140.3	32.93	1.26

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.Al2O3with less than 3.5% R.SiO2. 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.Al2O3) and 1.0% reactive silica (R.SiO2).
4. Mineral Resources have been estimated using a bauxite transfer price of USD16/t, as described in Section 11.11.
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.

11.2 Resource Database

11.2.1 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.

A summary of the drillhole database is outlined in Figure 7-1.

11.2.2 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.

11.3 Geological Interpretation

11.3.1 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 below.

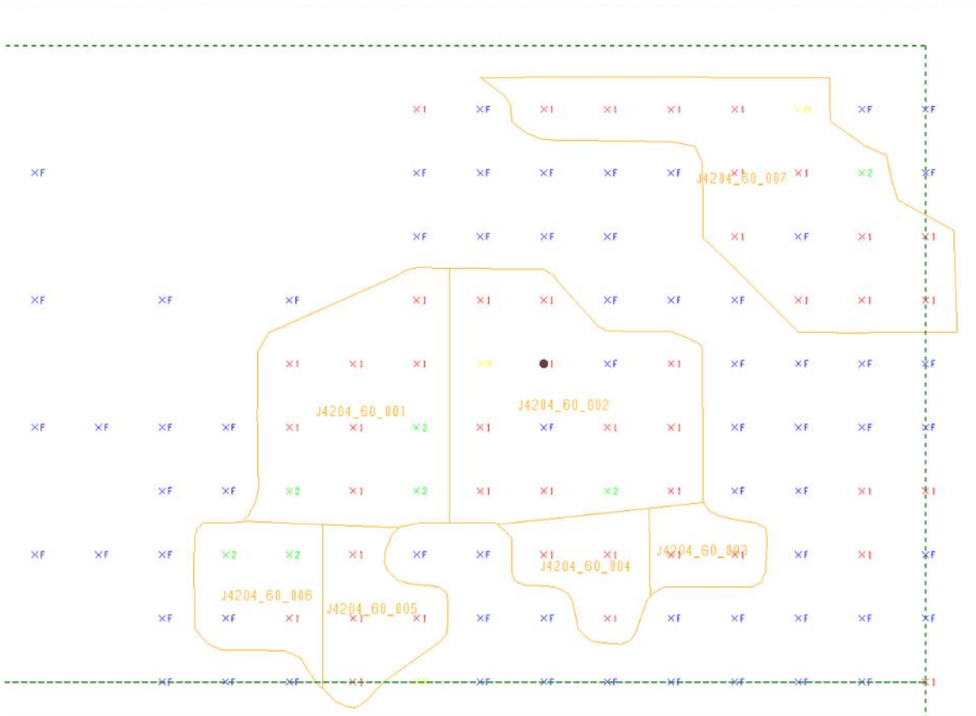


Figure 11-2: Plan View of Polygonal Approach (Pass = red, pass open = green, marginal = yellow, fail = blue) (Alcoa, 2022)

11.3.2 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 raised 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 typically smaller 'mining' blocks that each contain approximately 20 kt to 40 kt of Mineral Resource.

11.3.3 3D Block Models

Similar to the Polygon and GSM interpretation approaches, a set of rules written in Python scripts 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) is defined, namely overburden (DOMAF=99), caprock waste (10), caprock bauxite (20), bauxite (30), low-grade bauxite (40), and clay (50), as shown in Figure 11. 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 while 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 in DeepLime software package. To ensure a better fit of the wireframes, when the collar of the drill holes do not match with the topography, they are adjusted according to the topography surface. Where drill holes do not penetrate the full bauxite profile or 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.

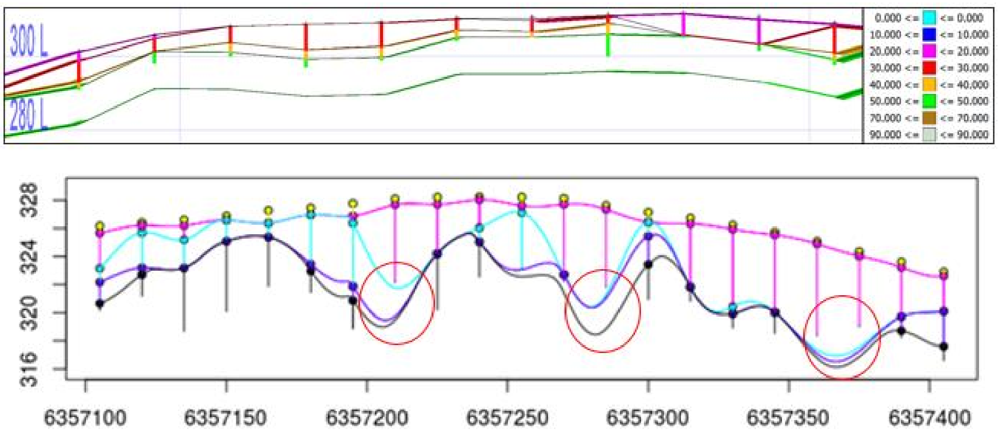


Figure 11-3: Example Section Showing Domain (DOMAF) and Wireframed Surfaces (top), and Regions where the Bauxite Layer was not Penetrated (bottom) (SLR, 2022)

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 dyke if 3 or more samples are flagged in this manner. The interpretation of dykes is carried out manually using local orientation trends and may be based on one or more holes (see Figure 11-4). They are assumed to be vertical, are extended laterally half-way between drill holes, and 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. The dykes tend to be well defined only when drill hole spacings are reduced to 15 m by 15 m.

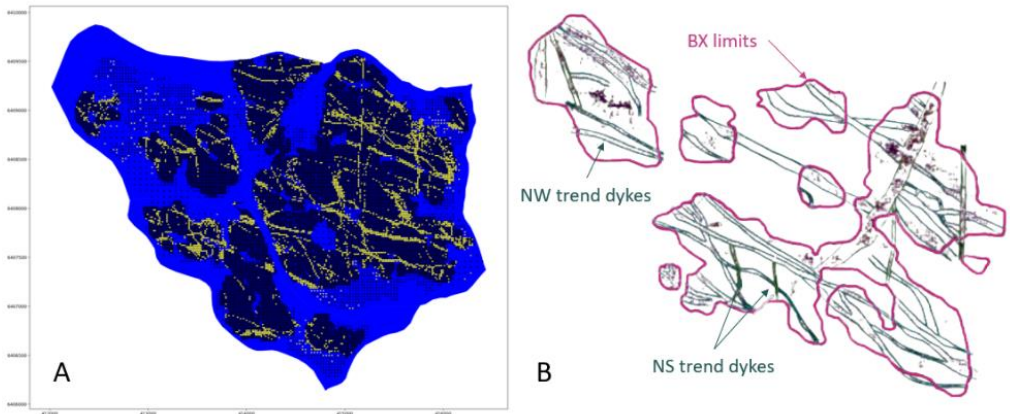


Figure 11-4: Plan View of Bauxite Zone and (A) Drill Holes Flagged as Dykes in yellow, and (B) Interpreted Vertical Dykes from the Drill Holes (Alcoa, 2022 – Modified by SLR)

While the dolerite dykes are delimitated in the geological modelling workflow and flagged in the block models, there is not a separated estimation workflow to different lithologies, being the current workflow used to the whole bauxite layer. A lateral boundary is interpreted to constrain the resource model and the 3D surfaces are extended where required. The lateral boundary, domain surfaces, and dolerite dyke interpretations are converted to wireframe solids. All the constraints where mining is not allowed (federal reserves, indigenous heritage sites, and rivers and protection buffers associated) are delimitated and removed after the geological modelling step. This way all the mineable reminiscent area is included in the final orebody perimeters.

11.4 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 11-5 for AL. The exception being SI, which is moderately to strongly positively skewed, as shown in Figure 11-6.

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.

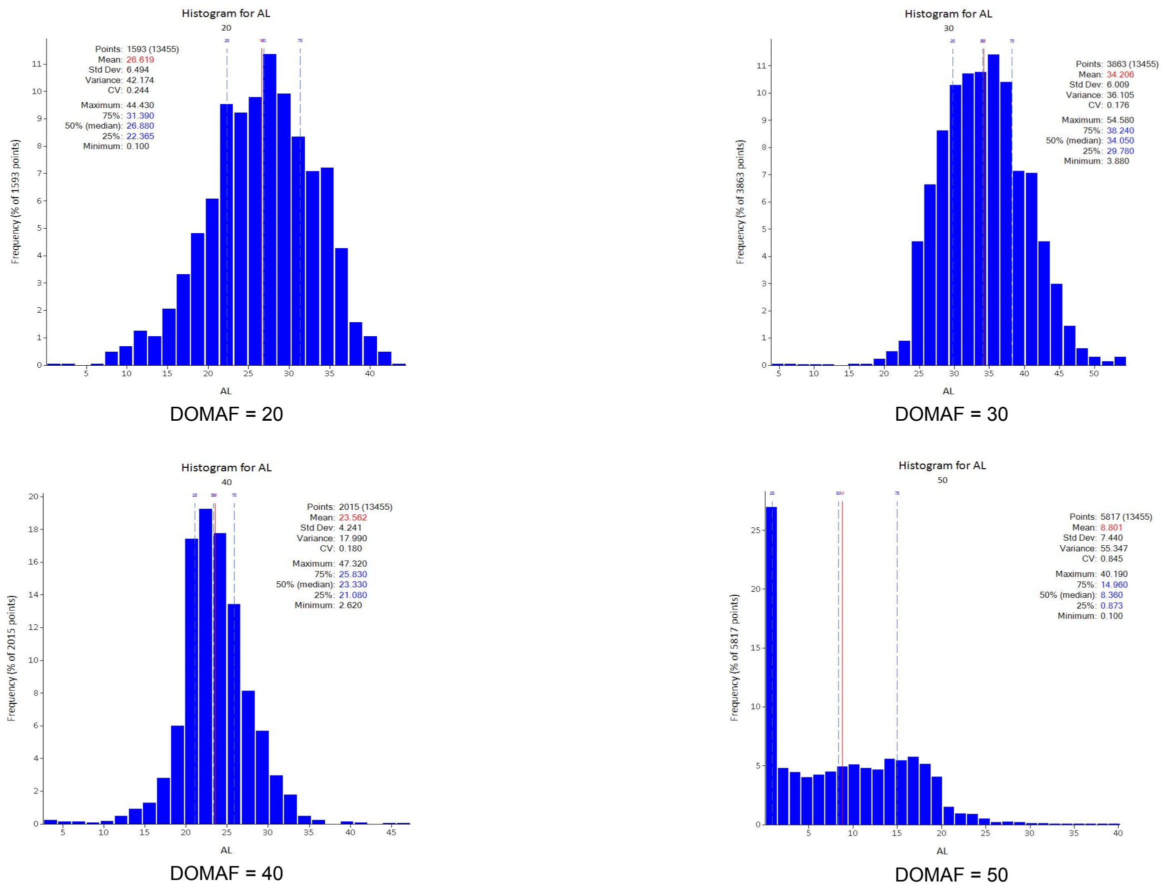


Figure 11-5: Histograms of AL by DOMAF at Serpentine

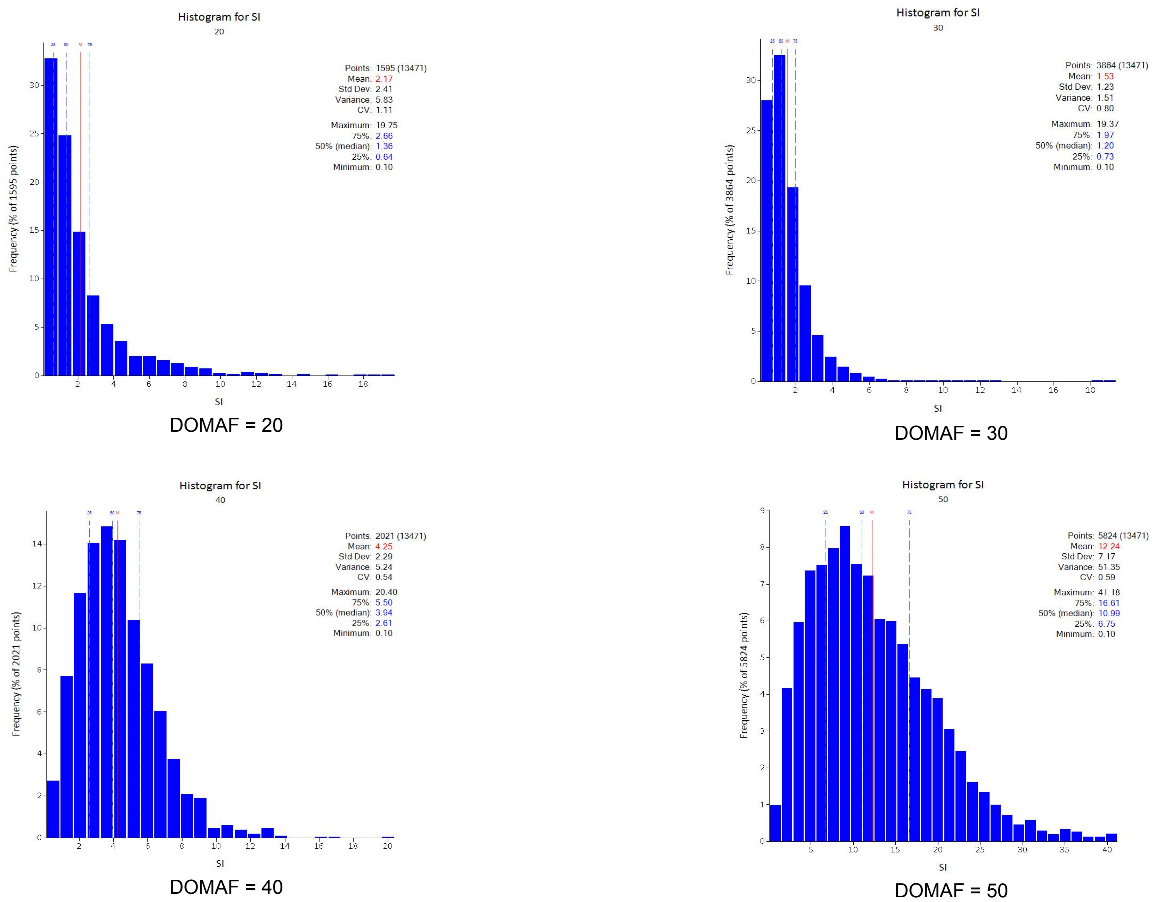


Figure 11-6: Histograms of SI by DOMAF at Serpentine

Figure 11-7 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 11-8 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.

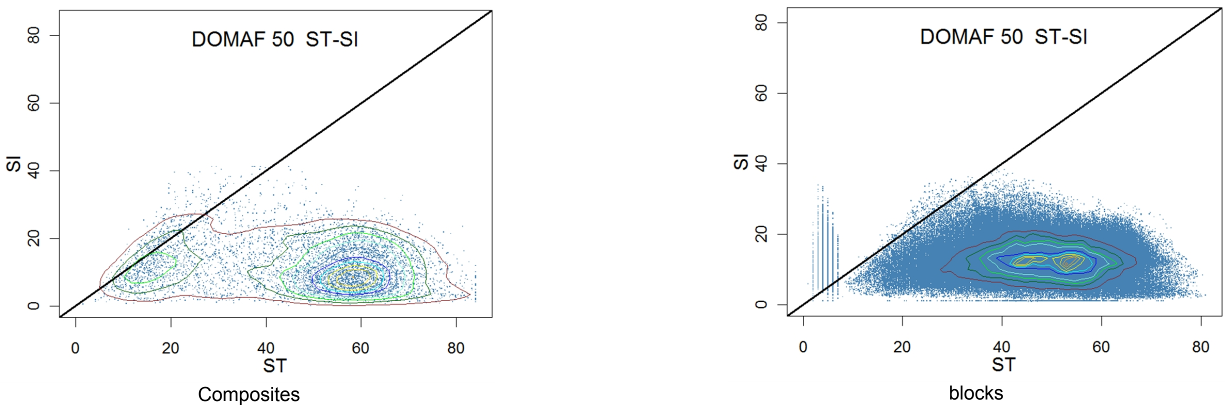


Figure 11-7: Scatterplots of SI versus ST for DOMAF 50 at Serpentine

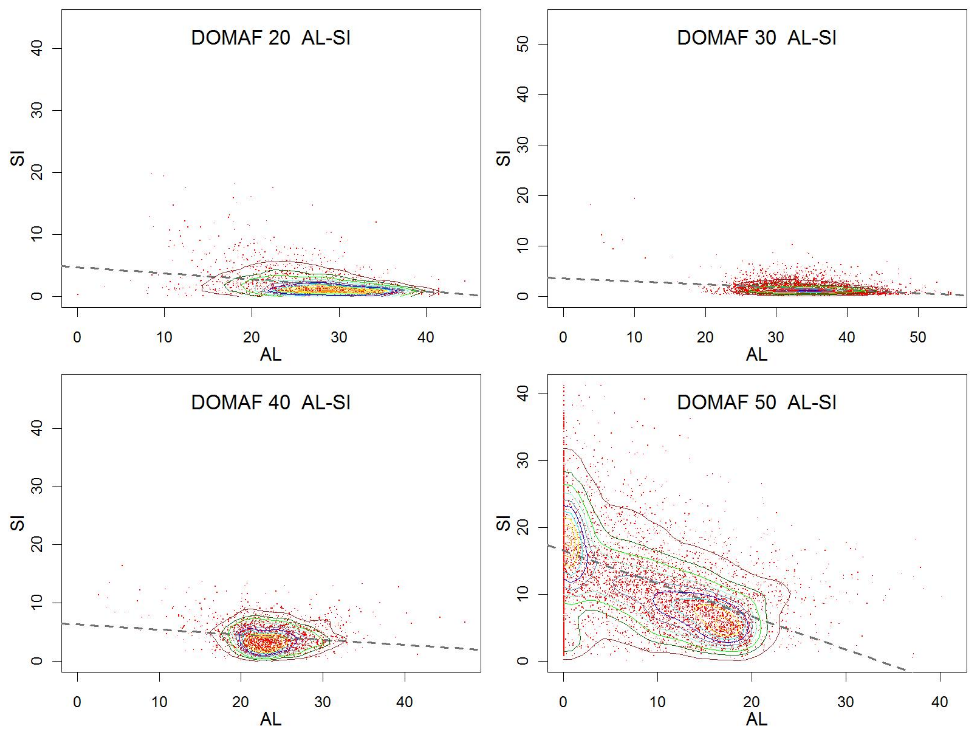


Figure 11-8: Scatterplots of AL versus SI by Domain at Serpentine

Missing values are kept as missing values in the database, as well as results below the detection limit are changed to values that are half of the detection limit.

11.5 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 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 11-9.

No high-grade spatial restrictions were used by Alcoa in the resource estimation process.

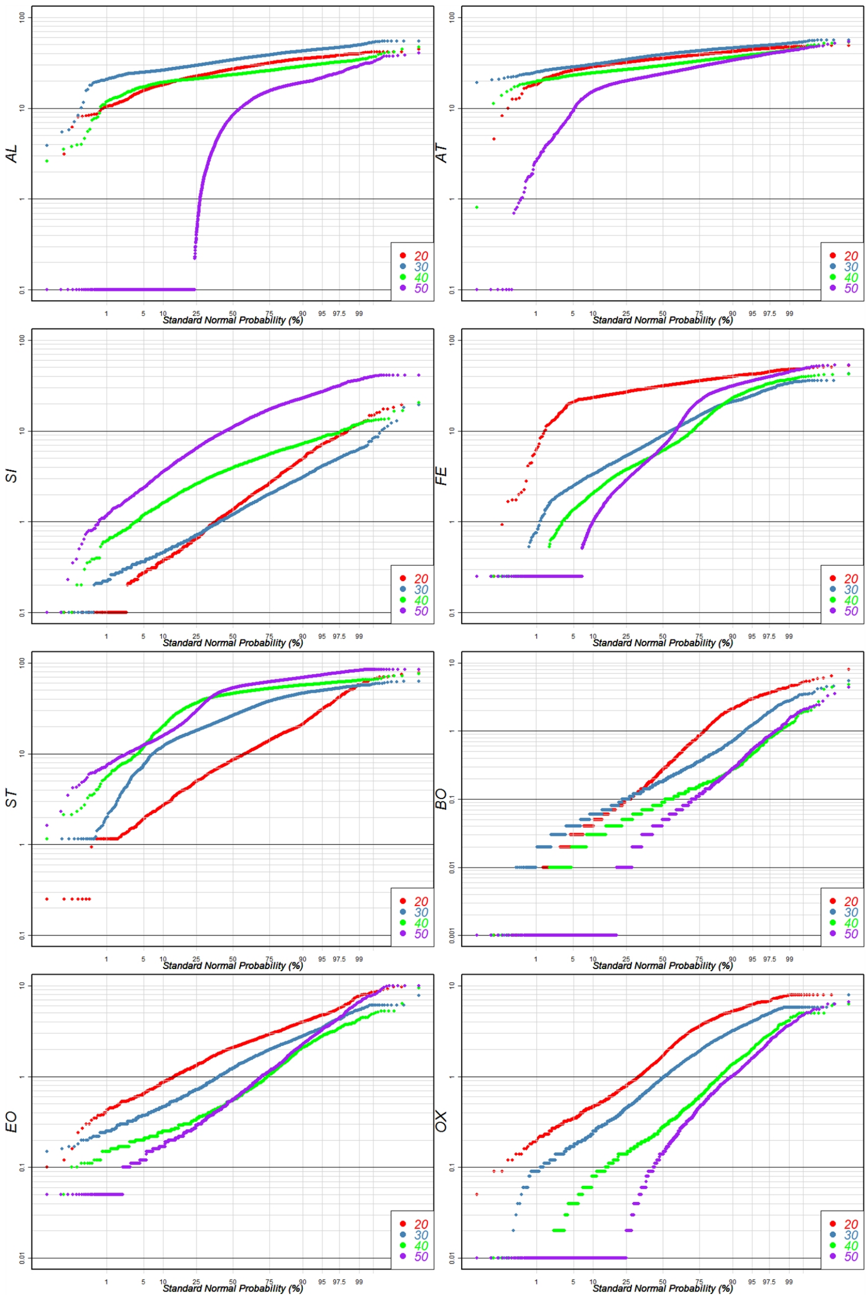


Figure 11-9: Cumulative Log Probability Plots for Serpentine Composites

11.6 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.

11.7 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 11-10. 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.

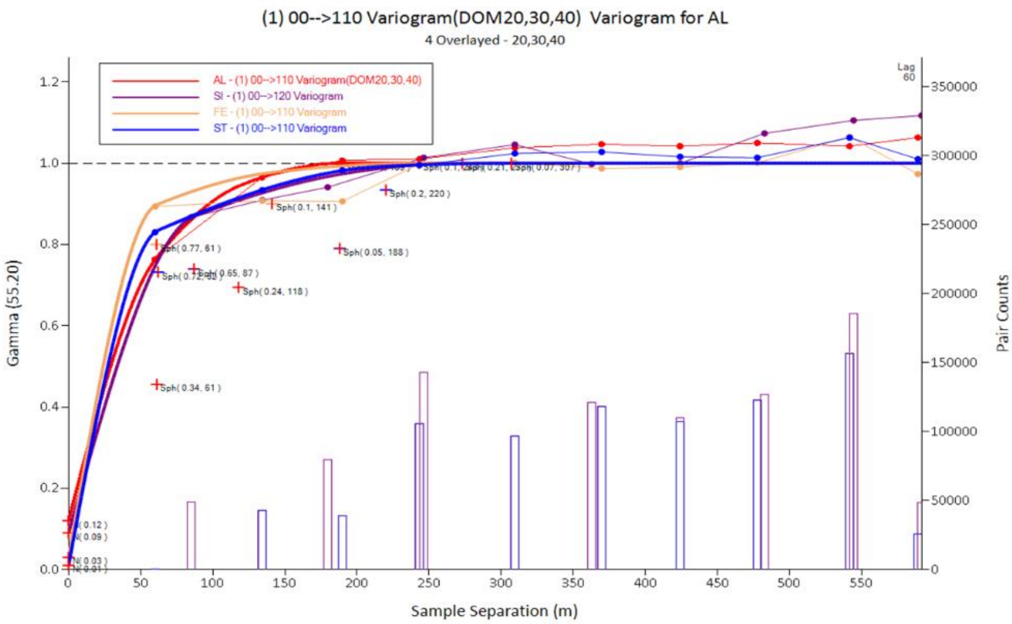


Figure 11-10: AL, SI, FE, and ST Directional Variogram Models at Serpentine

11.8 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 if large numbers of data points were 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.

11.8.1 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 Fe2O3 Slope	Regression On Fe2O3 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/m³.

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.

11.8.2 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.

11.8.3 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/m³ is significantly lower than that from the 2015 study of 2.23 t/m³. The drill samples did not account for porosity and voids and were not adequately sealed.

FTIR assays for Fe_2O_3 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.

11.8.4 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.

11.8.5 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/m³ to 3.2 t/m³, 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/m³ for all other material, weighted by the proportion of Hardcap or other material.

11.8.6 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.

11.8.7 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 t/m³. A constant moisture content of 9% is assumed for wet tonnages.

11.8.8 QP Opinion

In the QP'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.

11.9 Resource Models

11.9.1 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.

11.9.2 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 composites 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

11.9.3 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 98 3DBM representing around 76% of the Mineral Resource and Mineral Reserves (MRMR) tonnage.

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
- hard boundaries between the bauxite domains (DOMAF 20, 30 and 40) started to be implemented in 2022. The previous block models were estimated using soft boundaries between the bauxite domains.
- 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 samples 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. The sub-block model is then regularized to the parent block size (15 m by 15 m by 0.5 m), 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.

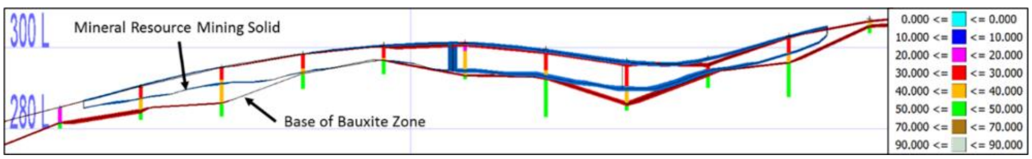


Figure 11-11: Example Section showing Bauxite Zone and Mining Solid (SLR, 2021)

Notes:

1. Vertical to horizontal exaggeration is 3:1
2. Drill holes colored by DOMAF variable

The QP summarized the information of 10 block models, showed in Table 11-4, where there is available the comparison between the estimation using soft and hard boundaries for the bauxite layer. In overall, the AL grades increased 7% and SI grades decreased 23%, and the tonnage is higher in most of the cases, reflecting the additional drilling.

Table 11-4: Tonnage and Grade Information Between the Original Resource Model and the 3D Block Model

Model	Original Resource Model			3DBM - Resource Model			Difference		
	Tonnage ('000 t)	A.Al2O3 (%)	R.SiO2 (%)	Tonnage ('000 t)	A.Al2O3 (%)	R.SiO2 (%)	Tonnage ('000 t)	A.Al2O3 (%)	R.SiO2 (%)

Model	Original Resource Model			3DBM - Resource Model			Difference		
	Tonnage ('000 t)	A.Al2O3 (%)	R.SiO2 (%)	Tonnage ('000 t)	A.Al2O3 (%)	R.SiO2 (%)	Tonnage ('000 t)	A.Al2O3 (%)	R.SiO2 (%)
Holyoake Central	25,211	31.97	1.94	25,919	34.12	1.23	3%	7%	-36%
Windsor	8,935	32.82	2.67	8,798	33.69	2.38	-2%	3%	-11%
Cooke	15,421	30.85	2.22	18,976	31.99	1.95	23%	4%	-12%
Serpentine	16,444	32.00	1.96	20,299	32.75	1.72	23%	2%	-12%
Gleneagle	26,333	31.58	1.67	35,144	34.69	1.14	33%	10%	-32%
Buckley	17,998	33.74	1.68	27,435	35.39	1.27	52%	5%	-24%
Cobiac	23,498	31.15	1.70	30,865	34.81	1.18	31%	12%	-31%
Frollett	12,556	30.07	1.68	18,587	33.59	1.31	48%	12%	-22%
Yarri	10,044	30.90	2.04	30,362	32.51	1.62	202%	5%	-20%
Millars	26,156	30.64	2.21	24,987	32.32	1.88	-4%	5%	-15%
Total	**182,596**	**31.55**	**1.93**	**241,372**	**33.71**	**1.48**	**32%**	**7%**	**-23%**

11.10 Block Model Validation

11.10.1 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.

The QP 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 45º 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 15 m 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 11-12.

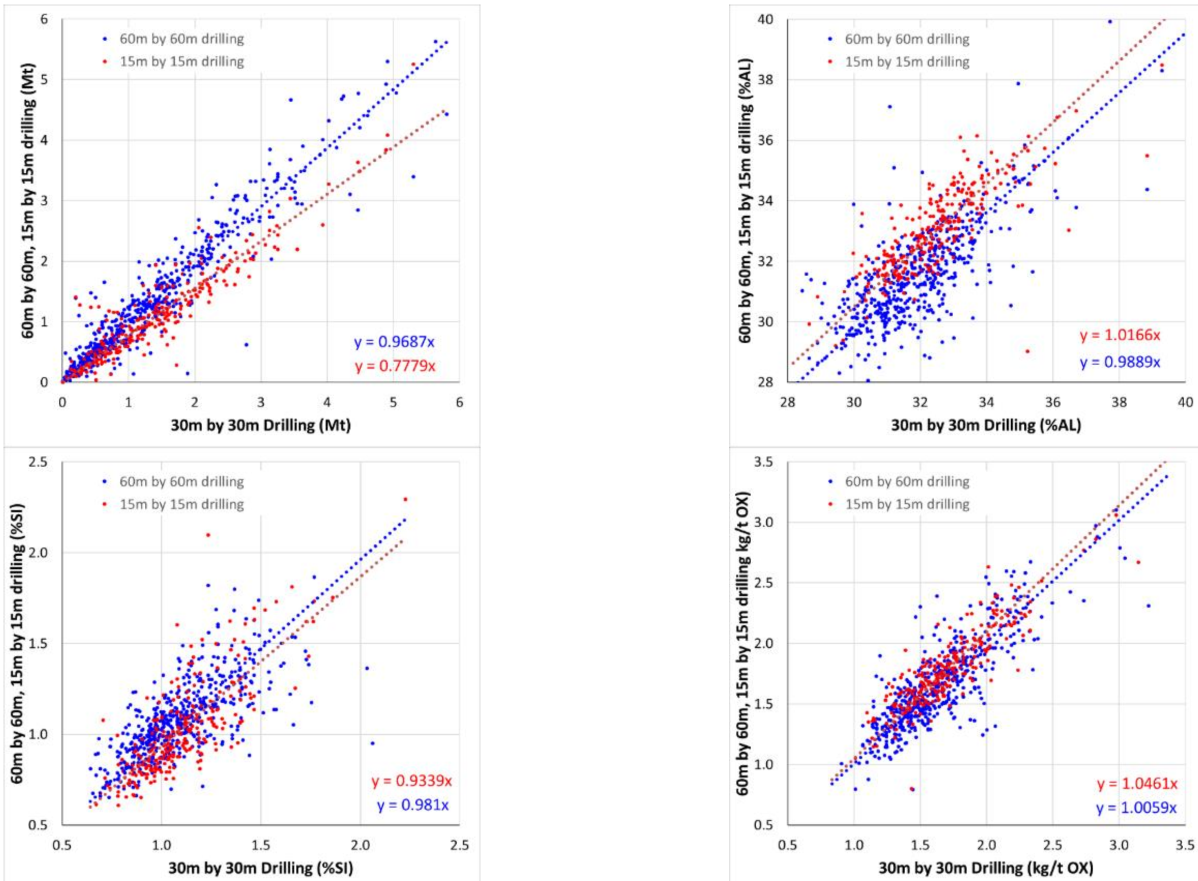


Figure 11-12: Resource Comparison Scatterplots for Huntly (Tonnage, AL, SI, OX) (SLR, 2021)

11.10.2 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 11-13.

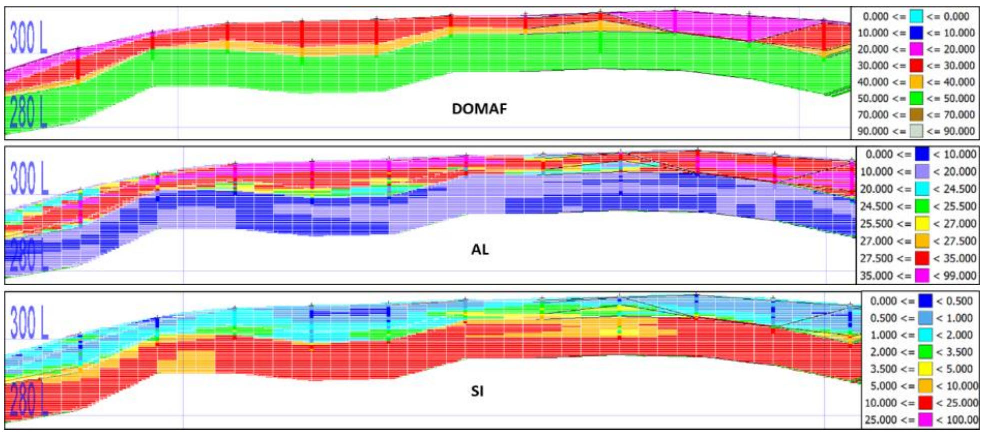


Figure 11-13: Example Sections showing DOMAF, AL, and SI Block Estimates (SLR, 2021)
3:1 vertical to horizontal exaggeration

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 11-14 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.

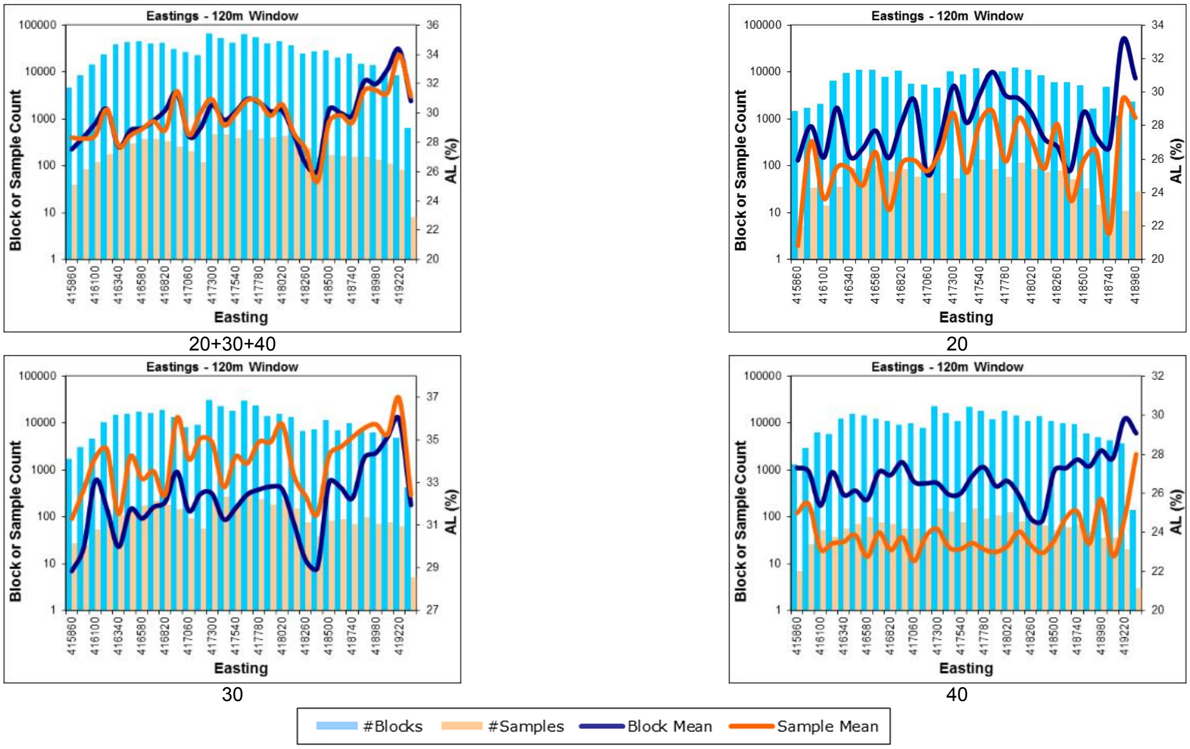


Figure 11-14: AL Swath Plots by DOMAF at Serpentine (SLR, 2021)

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. 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.

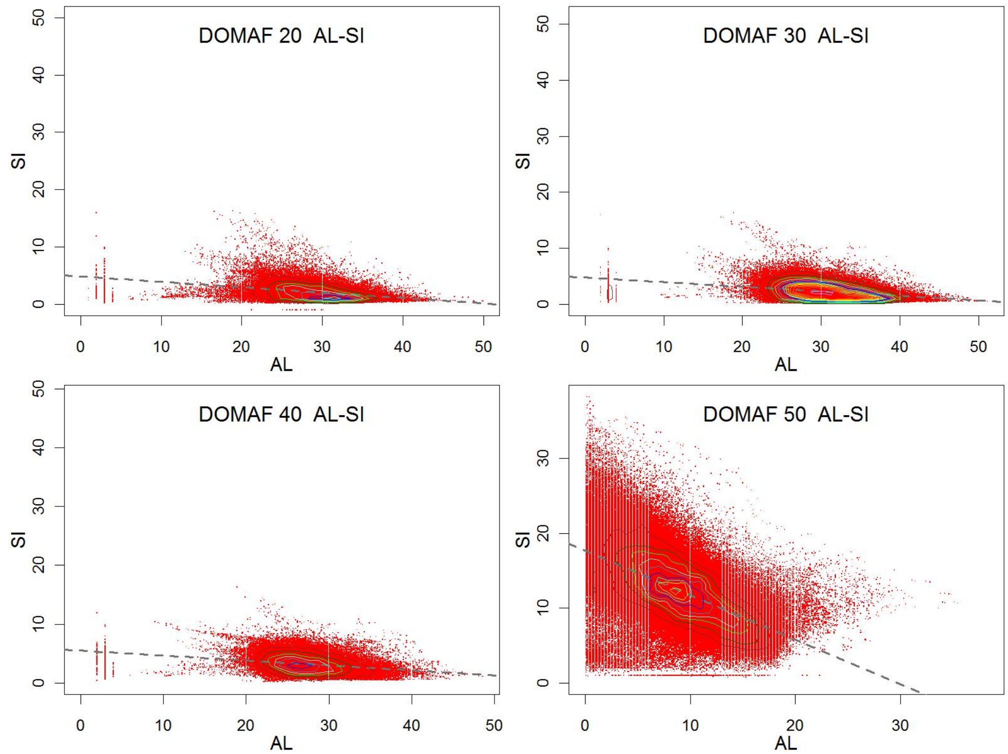


Figure 11-15: Scatterplots of AL versus SI by DOMAF at Serpentine (SLR, 2021)

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 11-16). 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.

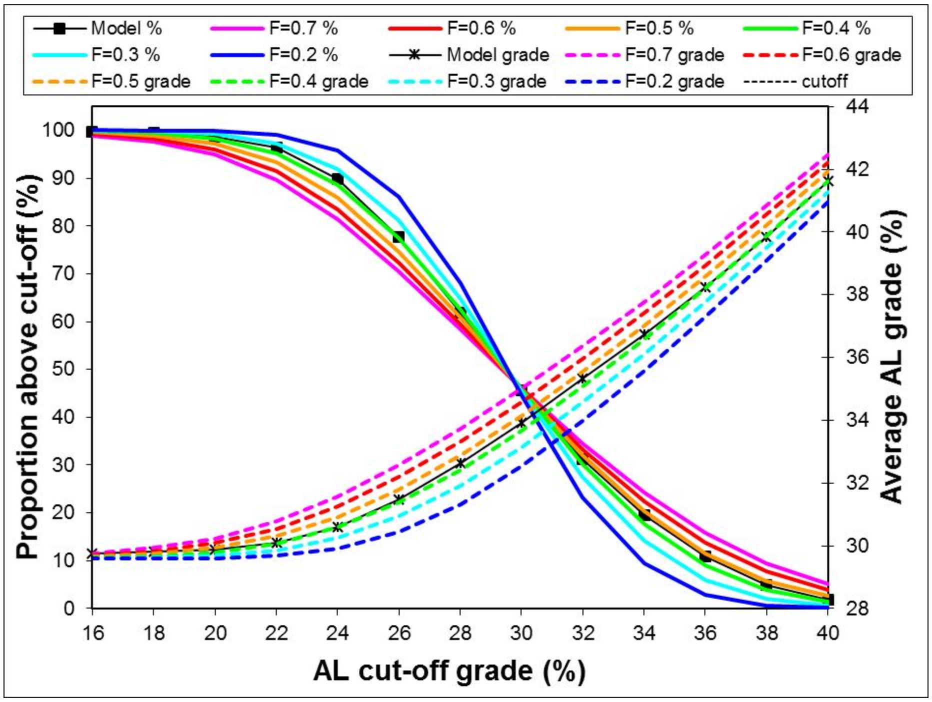


Figure 11-16: AL Grade-tonnage DG Curves versus Serpentine Block Model

11.11 Cut-off Grade and Mining Constraints

Darling Range uses a historically accepted economic Mineral Resource cut-off grade of ≥27.5% A.Al_2O_3, ≤3.5% R.SiO_2, and ≤4kg/t OX, that is implicit in the delineation of the bauxite layer in the geological modelling stage. A minimum thickness of 2 m is also used to improve the Mineral Resource definition.

In addition to the geological modelling cut-offs criteria, the constraints described below are applied to the GSM and 3DBM Mineral Resource definition:

- 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.

However, bauxite resources can include material outside the geological modelling grade cut-offs that may also be considered as mineable, and a cut-off depth basis is used when A.Al_2O_3 grade is lower to define whether or not a block is economic. Mineral Resources have been estimated using a LOM price of

$21/t representing an average arms-length sale of bauxite from Darling Range. The price that constrains the estimate for optimization was discounted to exclude export logistics costs, i.e. the base price was $21/t, and the discounted price was $16/t.

The grade cut-off criteria to report the Mineral Resources is a common approach to the bauxite mines, and the QP is of the opinion that to improve the recoverable resources reporting, a reblocked block model to a minimum practical mining scale or single mining unit should be considered. Economical parameters considering more flexible costs and bauxite prices related to the Mineral Reserves can also be implemented in the Mineral Resources workflow, aiming to optimize the bauxite mineable portion including potential marginal grades.

11.12 Reconciliation

11.12.1 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 SLR, 2022.

11.12.2 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 grade differences for both Huntly and Willowdale respectively. These plots indicate:

- A clear reactive silica trend from higher differences (above 20%) to lower differences (around 10%) from 2011 to 2021 and 2011.
- The most variable pattern of reactive silica compared with the other elements.
- That most As Mined grades are currently within 10% of the sample grades.

The sources of the reconciliation differences shown in Figure 11-17 and Figure 11-18 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 81 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.

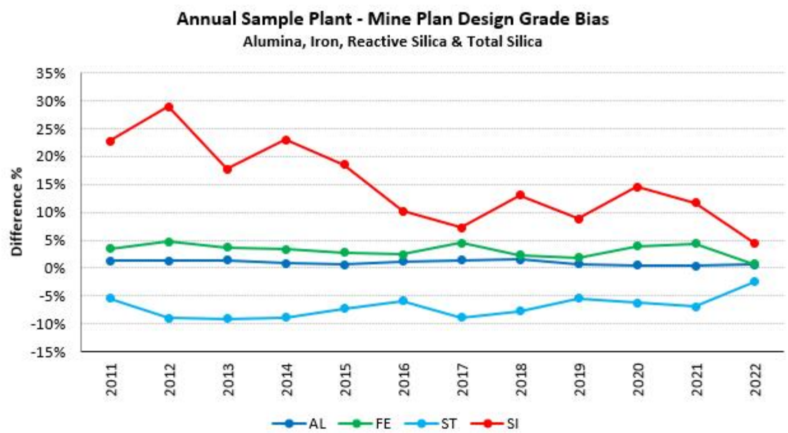


Figure 11-17: Resource versus Sample Plant Reconciliation – Huntly (SLR, 2022)

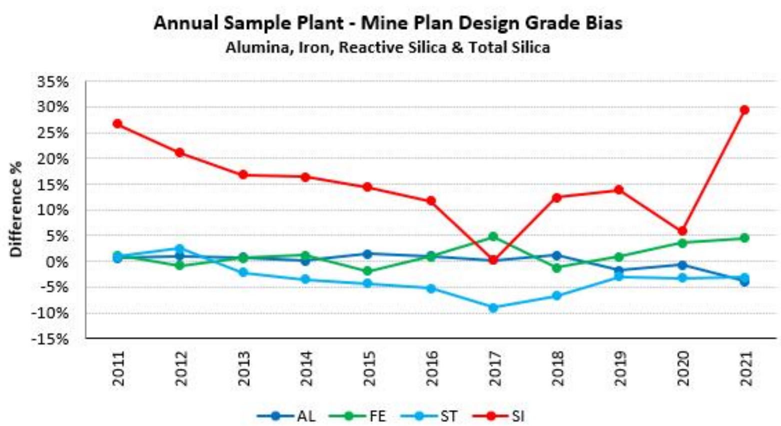


Figure 11-18: Resource versus Sample Plant Reconciliation – Willowdale (SLR, 2022)

11.13 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 Technical Report Summaries 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 Technical Report Summary 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 QP 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. The QP considers that the following risks specifically pertain to the Mineral Resources declared for Alcoa's Darling Rang operations.

11.13.1 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 Resources 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 Resources, 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 QP considers that these methods are appropriate to produce the declared Mineral Resources and Mineral Reserves.

11.13.2 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.

11.14 Classification

11.14.1 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 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/m³ 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 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: 64% exclusive Mineral Resource has been defined using polygonal techniques that 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.

The QP 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.

11.14.2 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 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 downgraded to Indicated, 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 assured 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 11-19. 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.

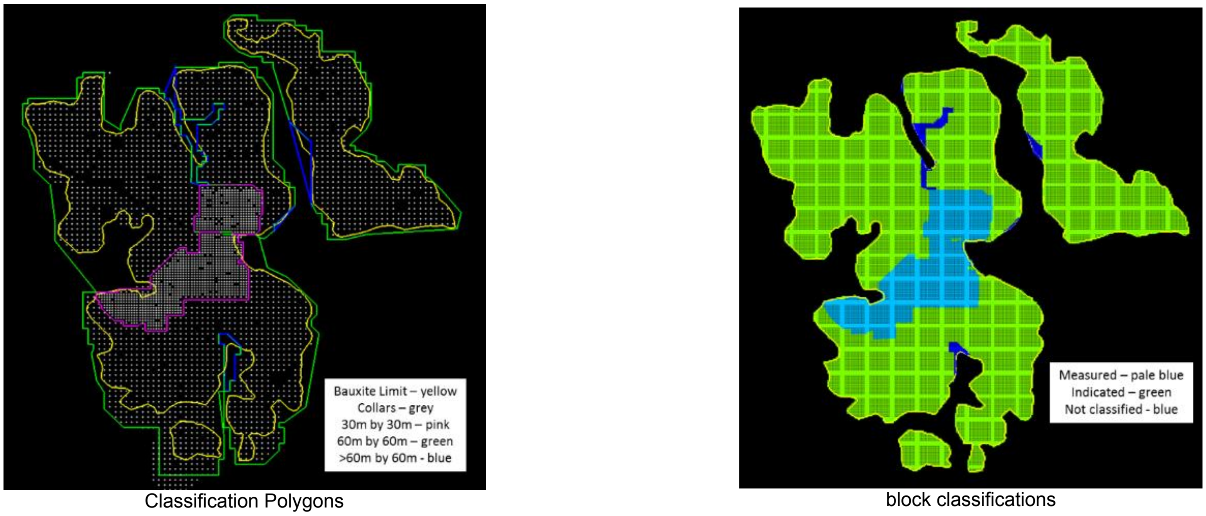


Figure 11-19: Plan View of Resource Classification (SLR, 2021)

11.14.3 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.

11.15 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.

11.15.1 Mineral Resource Estimation

A summary of the Mineral Resource estimates (exclusive of Mineral Reserves) for the three ML1SA mining regions is shown below.

Table 11-5: Summary of Darling Range Mineral Resources exclusive of Mineral Reserves by Mining Region – 31st December 2022

Category	Mine	Tonnage (Mt)	A.Al2O3 (%)	R.SiO2 (%)
Measured	Huntly	26.2	30.48	1.19
	North	0.0	0.00	0.00
	Willowdale	18.7	32.15	1.09
	Sub-total	**44.9**	**31.17**	**1.15**
Indicated	Huntly	44.4	31.59	1.16
	North	0.8	32.26	1.38
	Willowdale	6.6	29.95	1.25
	Sub-total	**51.8**	**31.40**	**1.17**
Measured + Indicated	**Huntly**	**70.6**	**31.18**	**1.17**
	North	**0.8**	**32.26**	**1.38**
	Willowdale	**25.2**	**31.58**	**1.13**
	Sub-total	**96.7**	**31.29**	**1.16**
Inferred	Huntly	44.5	34.74	1.39
	North	15.1	31.62	1.00
	Willowdale	80.6	32.17	1.24
	Sub-total	**140.3**	**32.93**	**1.26**

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.Al2O3 with less than 3.5% R.SiO2. 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.Al2O3) and 1.0% reactive silica (R.SiO2)
4. Mineral Resources have been estimated using a bauxite transfer price of USD16/t, as described in Section 11.11.
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.

Compared with December 31, 2021, the Measured and Indicated Mineral Resources (exclusive of Mineral Reserves) increased 17%, from 82.8 Mt, and the Inferred Mineral Resources decreased 56%, from 320 Mt. Changes from 2021 are due to the migration from polygonal and GSM models to the 3D block models, which upgraded the Resources category from Inferred to Measured and Indicated, and consequently it was converted to Reserves by the mine planning work. The A.Al2O3 average grade decreased 4% to the Measured and Indicated Resources and had a slight decrease for the Inferred Resource. R.SiO2 increased 4% and 5% in the Measured and Indicated Resources, and in the Inferred Resource, respectively.

11.16 QP Opinion

In the opinion of the QP the Mineral Resource classification scheme adopted by Alcoa and accepted by the QP 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 QP's opinion the modelling work completed to date is appropriate for purpose, and that following consideration of various technical and economic factors the conditions of Reasonable Prospects For Economic Extraction are met, including in particular through 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 reincorporating feedback into the geological model.

12.0 MINERAL RESERVE ESTIMATES

12.1 Summary

A Mineral Reserve has been estimated for Alcoa's Darling Range bauxite mining operations in accordance SEC S-K 1300 definitions 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 QP inspected the Alcoa Huntly operations on October 28th, 2022 and Willowdale on November 1st, 2022. Alcoa's Mine Planning department was visited November 2nd, 2022, interviewing relevant personnel on these dates and on other occasions. A full account of the site visit to the mines, offices and the refineries is provided in Section 2.1.

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 within a current mining region 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 or from Measured Resources that are outside the current mining regions.

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.Al2O3) and reactive silica (R.SiO2), this being the critical contaminant in relation to the Refinery.

Table 12-1: Summary of Darling Range Mineral Reserves – Effective 31st December 2022

Region	Class	Tonnage (Mt)	A.Al2O3 (%)	R.SiO2 (%)
Huntly	Proven	71.2	30.0	1.36
	Probable	180.3	32.4	1.20
	Total	251.5	31.7	1.25
Willowdale	Proven	74.7	32.7	0.98
	Probable	75.4	32.5	1.02
	Total	150.1	32.6	1.00
Total	Proven	145.8	31.4	1.17
	Probable	255.8	32.4	1.15
	Total	401.6	32.1	1.15

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 Corporation'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 generally 32.7% available aluminum oxide (A.Al2O3) and around 1.0% reactive silica (R.SiO2) but this may vary locally.
4. Mineral Reserves have been estimated using a LOM price of $21/t representing an average arms-length sale of bauxite from Darling Range. The price that constrains the estimate for optimization was discounted to exclude export logistics costs, i.e. the base price was $21/t, and the discounted price was $16/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 such 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 or Probable Mineral Reserves, subject to the Modifying Factors and mine scheduling constraints.

12.2 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 to a high standard. 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.

12.3 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.

The QP has used the December 31, 2022 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 and Front-End Loading (FEL 2), or pre-project planning study, for the recent major Myara capital crusher move. The QP has reviewed the operating and planning procedures and parameters for the operations, and considers that the work completed is sufficient to allow definition of Mineral Reserves.

Proven Mineral Reserves are derived from scheduled Measured Mineral Resources which are located within the current mining regions of Myara and Larego. Probable Mineral Reserves are derived from scheduled Measured Mineral Resources which are located outside the current mining regions, 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 as a result there is low risk to not establishing Proven Reserves relating to the project.

The Probable Mineral Reserve has been defined by 15 m by 15 m drilling. Application of the Modifying Factors is consistent with Proven Reserves.

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.

12.4 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.SiO2 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. Historically, this 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.SiO2. 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.

12.5 Extraction and Mine Planning

12.5.1 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).

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.

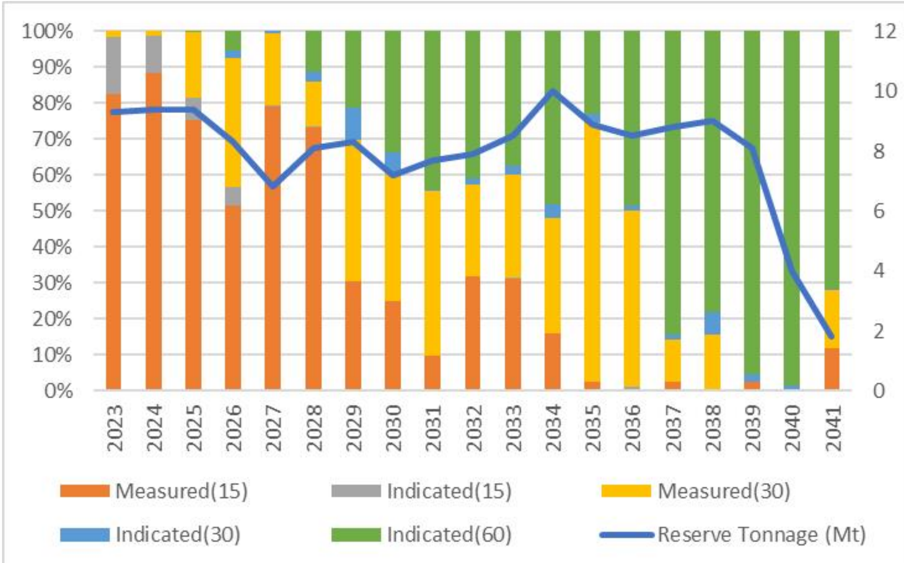


Figure 12-2: Willowdale Fifteen-Year Mine Plan Resource Confidence (drill hole spacing in meters shown in brackets) (Alcoa, 2022)

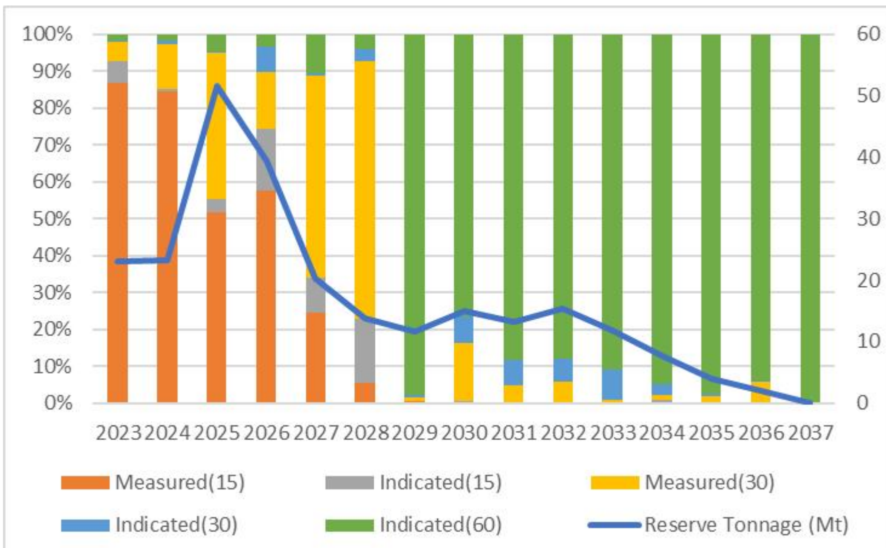


Figure 12-3: Huntly Fifteen Year Mine Plan Resource Confidence (drill hole spacing in meters shown in brackets) (Alcoa, 2022)

12.5.2 Mine Planning

Alcoa has been 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 mostly complete, 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 greater topographic relief, whereby mining progresses across the contour, maintaining as consistent a pit floor 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.

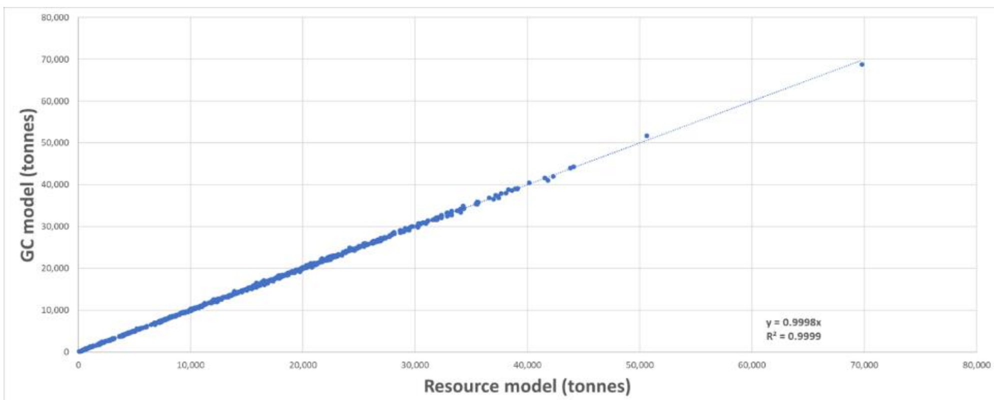
The regularized model is then coded for the above parameters and checked. All the above processes are logged, checked and validated both electronically and visually. Electronic scripts are then run in the mine planning software, resulting in the reporting of Mineral Reserves.

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 $21/t. The optimization uses $0.48 per unit alumina based on the average grades that are agreed with the refineries. A discount rate of 12.25% is mandated by the Finance Department and applied to the NPV scheduler during the mine planning process. The price that constrains the estimate for optimization was discounted to exclude export logistics costs, i.e., the base price was $21/t (updated annually to reflect a reasonable market expectation of arms-length sales of bauxite from Darling Range), and the discounted price was $16/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.



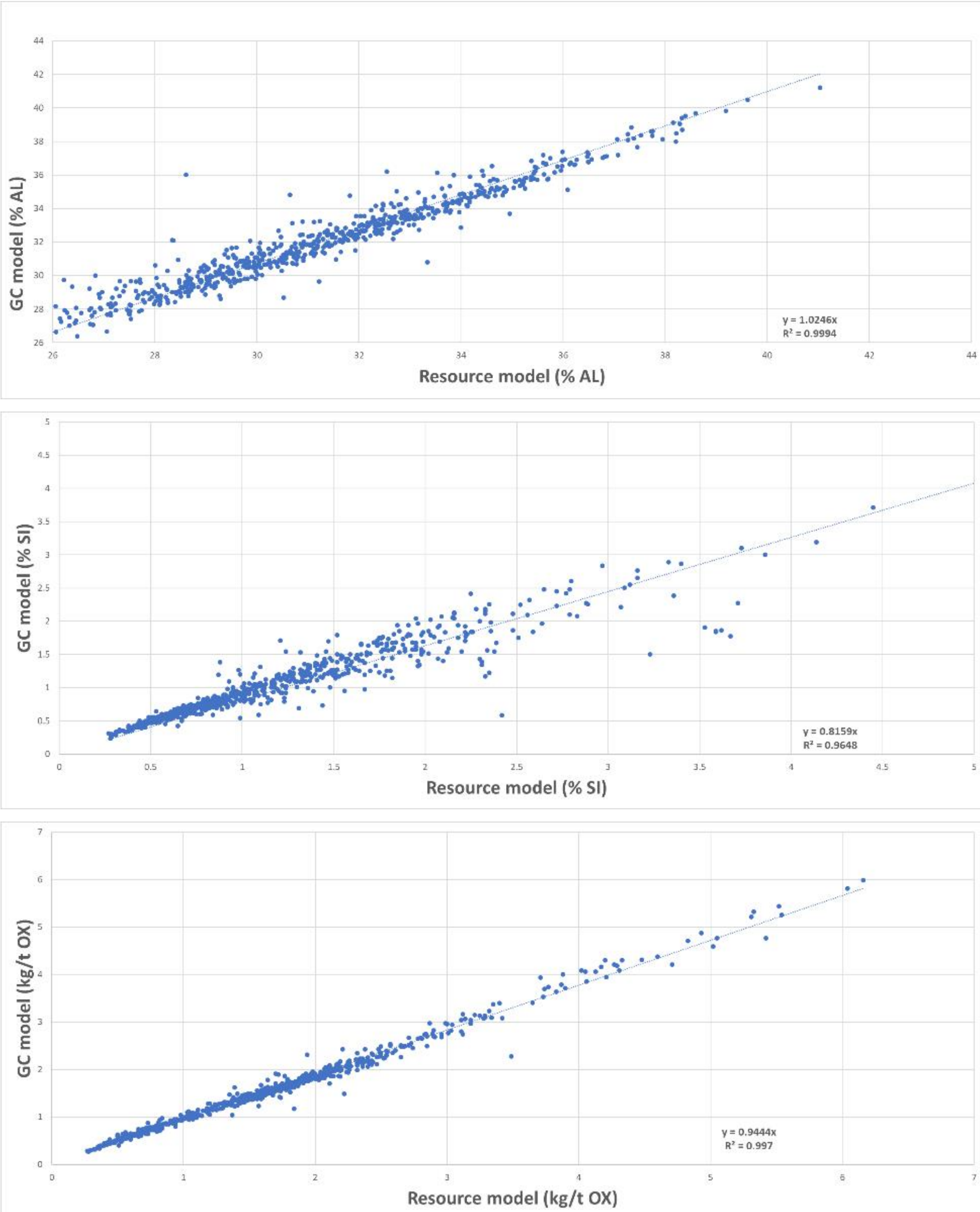


Figure 12-4: Example of Reconciliation Between Mineral Resource and Grade Control Models for Tonnage, Al, Si, and OX (Alcoa, 2022)

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 (Huntly) & 11 Mtpa (Willowdale). 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.

12.5.3 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.

12.6 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 be updated annually to reflect a reasonable market expectation of arms-length sales of bauxite from the Darling Range.

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.Al2O3 and 3.5% for R.SiO2. Commodity pricing is described previously in Section 12.5.2.

12.7 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 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.SiO2, 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.Al2O3 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.

12.8 QP Opinion

The 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 2022.

At the time of the review there was no adverse operational risk associated from the COVID-19 pandemic. The mines were operating at full capacity.

The operations are sensitive to actual mined grade, as such lower alumina or higher reactive silica grades remain a risk to the overall economics. Alcoa have demonstrated through their Grade control program an effective control to minimizing the dilution and mining at their forecast grades. The grade control is particularly important along ore-waste boundaries to maintaining expected mined grades, Alcoa demonstrate processes to handle and define boundaries to mitigate these risks.

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 manage such risks by defining when then major plant needs to be relocated.

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.

13.0 MINING METHODS

13.1 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 11 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.

13.1.1 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 ahead of mining allowing time for harvesting of saleable timber before vegetation clearing.

13.1.2 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.

13.1.3 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, 2022)

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 m³ 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. During the 2022 visit the surface miner was not operational.

13.1.4 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 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.

13.2 Haul Roads and Infrastructure

13.2.1 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 QP 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.

13.2.2 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.

13.3 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)

13.4 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 2x Komatsu PC3000 3x 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 CAT 992K 2x CAT 993K 2x CAT 980 Loaders
		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 Hitachi ZX360 2x Komatsu PC2000
		Haul truck 1	12x Komatsu 730E (190T)
		Haul truck 2	1x HD1500 (150T)
	Ancillary	Bulldozer / Loader	3x CAT D11T 1x CAT 993K 1x CAT 992G 1x Komatsu WA320
		Grader	1x CAT 16H 1x CAT 18M
		Scrapers	3x CAT 637K 1x CAT 637G 1x CAT 637E
		Low Loaders	1x CAT 785D (220T)
		Water truck	2x CAT 777F 2x Komatsu 730E
		Drills	2x Epiroc D50 (Blast)

13.4.1 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.

13.4.2 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. The current mining areas are shown in Figure 3-2.

13.5 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. The Enterprise Agreements (EA) have varied timing for expiration. Currently the AWMU are negotiating a new agreement, the ETU EA was negotiated at the end of 2021, with a 4 year term. The AWU Agreement expires at the end of 2023.

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.

The recent increase in metals prices has driven higher than usual turnover across the industry, which has impacted on the traditionally low turnover. It is still below industry standard, as the drive in, drive out nature of the work attracts many to work at Alcoa.

As of December 2022, the Huntly and Willowdale operations together employ a total of 887 employees consisting of 48 technical, 77 management and 762 operations employees. Additionally, 67 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 611	Technical	37
	Management	50
	Operations	524
Willowdale 276	Technical	11
	Management	27
	Operations	238
Central 67	Technical	18
	Management	8
	Operations	41
	Total	**954**

14.0 PROCESSING AND RECOVERY METHODS

14.1 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.

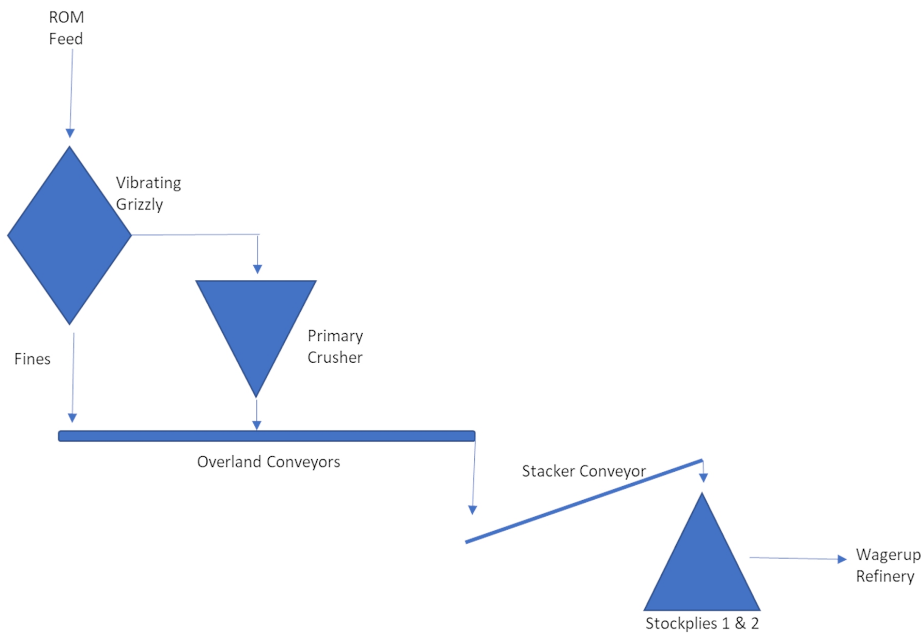


Figure 14-1: Simplified Block Flow Diagram of the Willowdale Operation

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 Pinjarra 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.

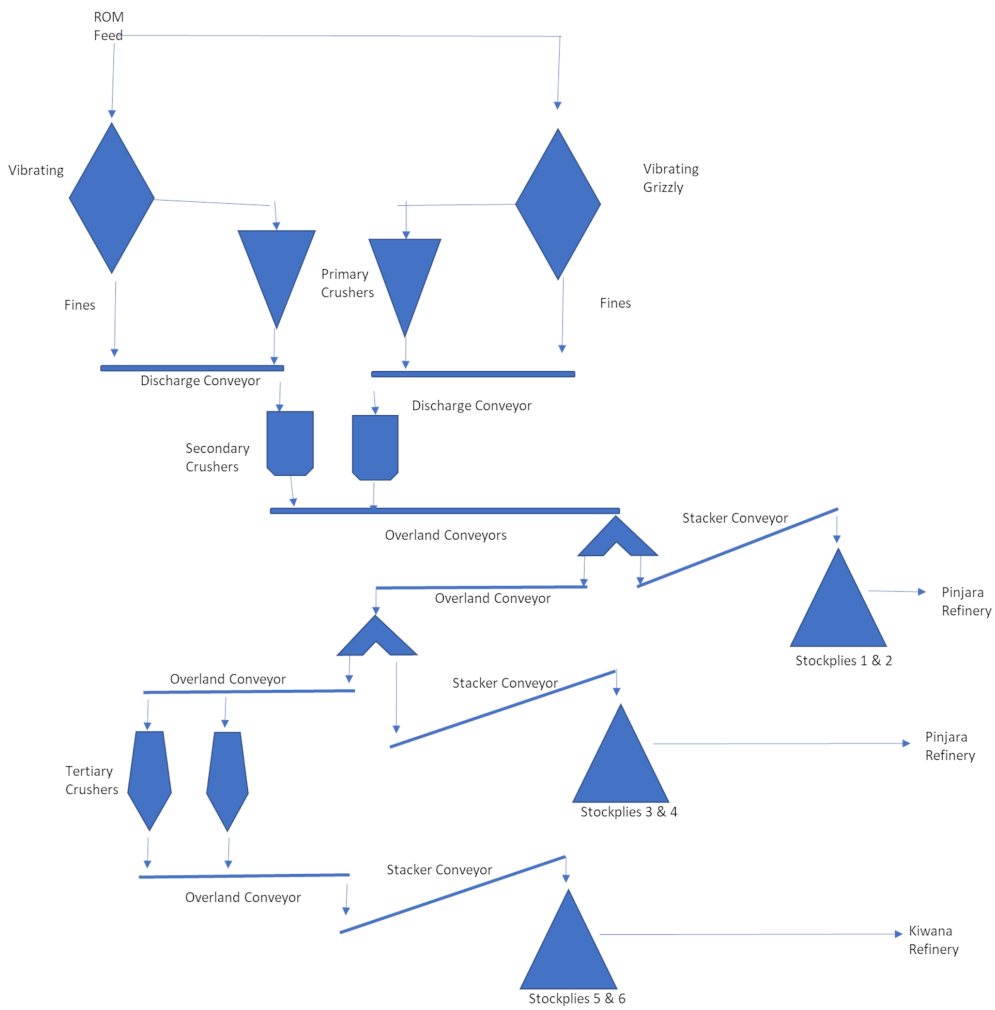


Figure 14-2: Simplified Block Flow Diagram of the Huntly Operation

14.2 Primary Equipment List

The primary equipment lists of the Willowdale, and Huntly operations are shown in Table 14-1 and Table 14-2.

Table 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

Equipment	Quantity	Installed Power (kW)
Overland conveyor	1	1500
Apron feeder	1	55
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

14.3 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.

14.4 QP Opinion

The QP is of the opinion that the selected processing method and the flowsheet are 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.

15.0 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 with infrastructure decommissioning planned for 2024.

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).

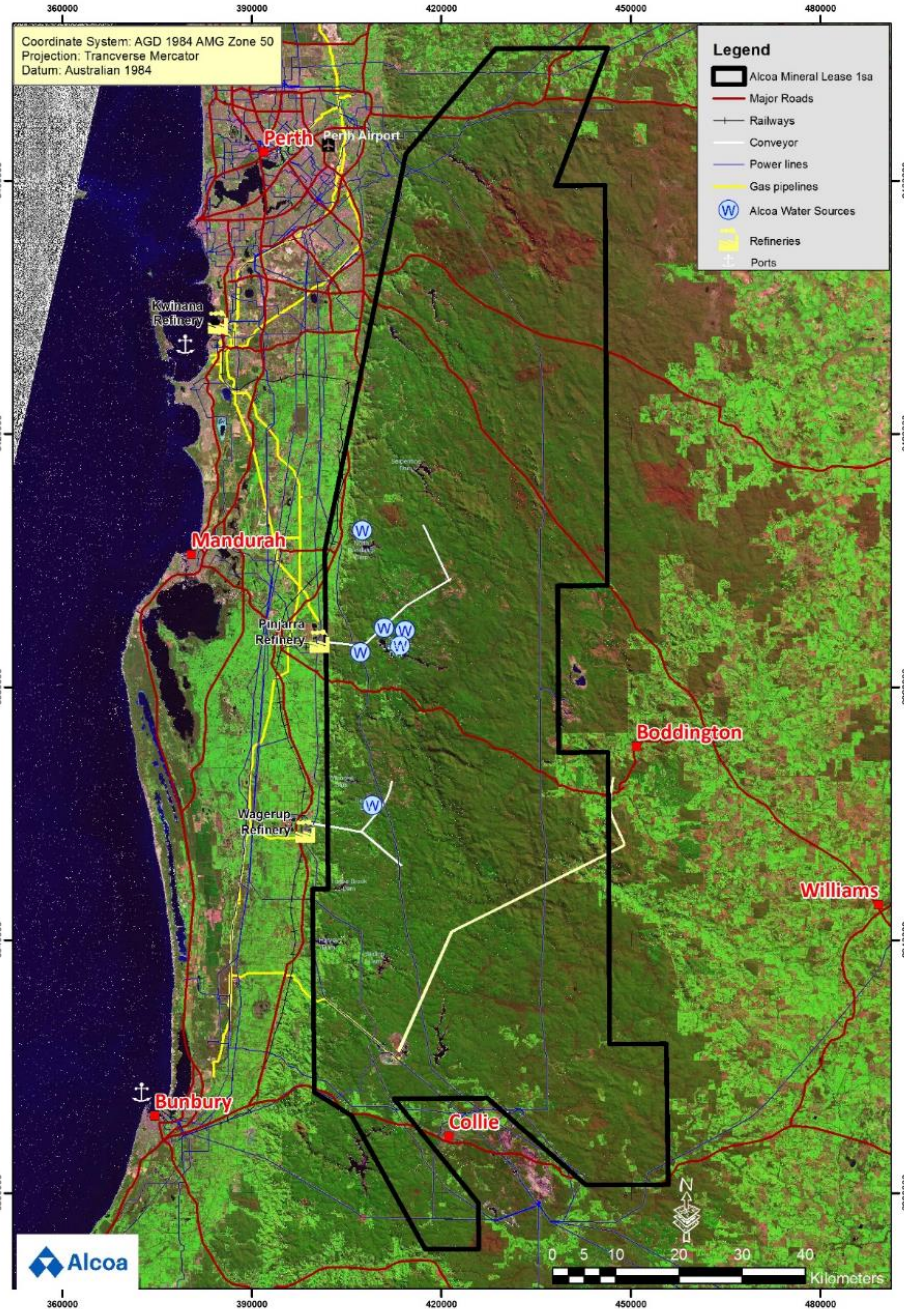


Figure 15-1: Infrastructure Layout (Alcoa, 2022)

15.1 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 Willowdale Road, a sealed single carriageway road to the south 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.

15.2 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.

15.3 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 2021, water abstraction comprised approximately 74% of the total DWER license allocation (for those sites where abstraction occurred). An additional 336,105 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

15.4 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 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.

15.5 Mine Waste Management

15.5.1 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.

15.5.2 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 around 75% 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.

16.0 MARKET STUDIES

16.1 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 27 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 2022, total Alcoa production was 42.1 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.

16.1.1 Market Fundamentals

Bauxite is the principal ore of alumina (Al2O3), 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.

16.2 Market: Darling Range

16.2.1 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.

16.2.2 Pricing

In 2016, Darling Range entered into a 5-year third-party sales contract with a major alumina producer in China. Following the expiration of the third-party sales contract at the end of 2021, all bauxite production from Huntly and Willowdale was consumed internally by the Darling Range.

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.

A price of $19/t has been utilized for 2022 with an estimate for economic market-based factors applied throughout the LOM.

16.3 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.

17.0 ENVIRONMENTAL STUDIES, PERMITTING, AND PLANS, NEGOTIATIONS, OR AGREEMENTS WITH LOCAL INDIVIDUALS OR GROUPS

17.1 Environmental Studies

17.1.1 Existing Operations

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.

Regarding existing operations, 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 the current mine operability or Reserve estimation.

Approvals for the mining of future resources are being evaluated under Part IV of the Western Australian Environmental Protection Act 1986 to ensure appropriate consideration of environmental constraints. Environmental constraints on the resource are 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.).

17.1.2 Future Mining Operations

Alcoa is modernizing its environmental approvals framework for its Huntly Bauxite Mine and Pinjarra Alumina Refinery, by referring future mining plans for assessment under Part IV of the Western Australian *Environmental Protection Act 1986* and the Australian *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). The future mining plans that have currently been referred to both state and federal departments includes:

- The transition of Huntly Mine into the proposed Myara North and Holyoake mine regions within Alcoa's Mining Lease ML1SA (inclusive of bauxite for the Pinjarra Alumina Refinery and the Kwinana Alumina Refinery).

The Western Australian Environmental Protection Authority (State) has determined that the Pinjarra Alumina Refinery Revised Proposal (Assessment No. 2253), which includes the Huntly Bauxite Mine, will be assessed via a Public Environmental Review (PER).

Alcoa referred two separate Proposed Actions under the EPBC Act (Federal) for the following components:

- Huntly Bauxite Mine Transition – Myara North and Holyoake; and

- Pinjarra Alumina Refinery – development of water storage ponds and associated borrow pits.

The referred actions have been determined as Controlled Actions under the EPBC Act, and as such, require formal assessment.

The resulting Environmental Impact Assessments (EIAs) under State and Federal legislation will inform stakeholders on long-term mine plans and environmental management requirements and facilitate the setting of approval conditions.

Construction for Myara North will be commenced pursuant to the requirements of the Ministerial Decision, which will be issued upon completion of the EPA assessment process indicatively forecast for completion circa Q3 2024. Alcoa plans to commence construction, to facilitate the transition to Holyoake Central, from approximately 2028 and commence operation from approximately 2030.

Numerous baseline studies have now been completed to support approvals for future extensions to the mining footprint to the Myara North and Holyoake regions. Baseline studies are guided by the requirements of the Western Australian Environmental Protection Authority (EPA) and guidelines under the EPBC Act and are well understood. Several baseline environmental studies were undertaken in 2021 and 2022 within the Myara North and Holyoake mine development envelopes, to define the environmental values and constraints associated with:

- Flora and vegetation
- Short-range endemic vertebrates
- Aquatic and subterranean fauna
- Phytophthora dieback
- Terrestrial fauna and black cockatoo habitat
- Surface water
- Groundwater quality and dewatering drawdown
- Air quality
- Noise
- Landscape and visual impacts
- Historical and aboriginal heritage

Additional environmental studies were separately undertaken to identify regional environmental risks associated with PFAS in surface water catchments around the current and future Huntly and Willowdale operations.

17.2 Waste and Tailings Disposal, Site Monitoring, and Water Management

17.2.1 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.

17.2.2 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.
- The management of mining within the lower rainfall zone to minimize risks of salinization of land and water resources.
- Surface water catchment protection for the nearby Public Drinking Water Source Areas (PDWSAs).
- 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, JTSI Annual Environmental Review 2021 (dated August 2022), largely reported compliance with environmental commitments and success of operational controls to managed environmental objectives, with only the following reportable incidents noted:

- Four dieback breaches at Huntly and two dieback breaches at Willowdale were reported resulting in a downgrade to dieback status of vegetation. Two dieback events were the result of incorrect identification of dieback lines by operators in the field, and the other events were due to surface water flow from a dieback area to a dieback-free area. All incidences were investigated with corrective actions addressing the root causes actioned.
- Several surface water recordings of elevated turbidity were recorded for a period exceeding 1 hour above the reporting criteria (25 NTU). There were 30 turbidity events recorded at Huntly in 2021, 20 of which were confirmed to have been affected by mine site contributions. The remaining ten events did not have any mine site contributions identified. There were 14 turbidity events at Willowdale recorded in 2021, two of which had identified mining contributions. Four events had non-mining related contributions identified. The remaining eight events did not have an identified cause. All incidences were investigated with corrective actions addressing the root causes actioned where mining contributions were identified.
- Alcoa reported 105 loss of containment (LOC) events at Huntly and 49 LOC events at Willowdale in 2021. Reportable events (over 20L) were associated with LOC of diesel fuel and hydraulic oils, PFAS-free AFFF fire suppressants, and coolants largely associated with the mobile maintenance and operations fleet. In response to release events, a range of LOC reduction initiatives were developed to address common failure mechanisms within equipment fleets, to reduce the frequency of recurrence.
- Alcoa voluntarily reported nine incidents under *s.72* in 2021. Huntly Mine reported four PFAS-free AFFF releases and Willowdale Mine reported five PFAS-free AFFF releases. Alcoa completed a program to remove all AFFF fire suppressant foams which contained PFAS from all heavy vehicles (including contractor fleets) from both mine sites in 2021.

Alcoa is proactively working with key regulatory agencies to address operational incidents and implement operational improvements to reduce releases to the environment.

17.2.3 Water Management

Alcoa implements a comprehensive water management and monitoring program in accordance with the requirements of its surface water 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 Drainage Control 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
- A groundwater monitoring program commenced in H2 2022 across the Darling Range operations to support approvals and operational monitoring.
    - Alcoa will continue to expand its monitoring program, as necessary, if groundwater quality or quantity has been identified as potentially at risk due to operational or 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.

Baseline water quality monitoring has been undertaken at Myara North and Holyoake as part of the Part IV approvals process for these mining areas. It is anticipated that groundwater monitoring will be required as part of the operational license for these deposits.

17.3 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 2021.

Compliance with the Alcoa ISO14001 accredited EMS was audited in December 2021, with recertification issued in May 2022. This recertification is valid until May 2025.

There are no known requirements to post performance or reclamation bonds.

17.4 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 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.

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.

17.4.1 Community Consultation

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.

In 2019, Alcoa engaged Ipsos to undertake stakeholder perception research among key stakeholders and communities to better understand perceptions and expectations of Alcoa and its operations in Western Australia. Three audiences were included in the benchmark wave of research: Perth Community, Host Community and Stakeholders. Two years later in 2021, a second wave of research was conducted with a focus on two of the three audiences from the benchmark wave: Perth Community and Host Community. A deep dive was added for two host communities, Jarrahdale and Dwellingup to understand community perception in greater detail in these communities. Results of the perception survey were detailed in the *Reputation Measurement and Management Wave 2 Report* (Ipsos, 2022). The benchmark research in 2019 revealed that while Alcoa had been successful in building and maintaining a strong reputation and associated social license in Western Australia, there was a growing need for its approach to stakeholder management to be modified in the face of evolving and increasing stakeholder expectations. The second wave of research in 2021 has revealed the community issues identified in 2019 intensified. These changing expectations mirror what is being experienced by the extractives sector locally and globally. A realization that mining is finite and a growing concern for the environment is driving host communities to demand a newly-defined social contract with resources companies. These issues are intensified for Alcoa given its proximity to the Perth metropolitan area, other towns and competing land users and uses, as well the fact that it operates within the jarrah forest and Perth's water catchment area.

Alcoa's move towards formal, publicly scrutinized environmental impact assessment and approval under the State and Federal acts (Section 3.6) for the extraction of future resources will provide greater transparency around Alcoa's future operations that should go some way to addressing the challenges it faces.

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.

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.

17.4.2 Social Performance Management System

Alcoa is implementing a Social Performance Management System (SPMS) across its global operations. Alcoa has conducted a gap analysis of existing practices against best-in-class social management systems and defined a program to close these gaps, which are mostly related to developing a more structured approach to social risk management and formalizing Alcoa's social performance actions. Since 2022, Alcoa will focus on:

- Better understanding and engaging with our communities and stakeholder through:
    - Perception surveys
    - Community and stakeholder engagement plans
    - Socio-economic baselines
- Understanding and managing our risks, impacts, and opportunities through:
    - Social risk assessments
    - Social investment reviews
    - Social impact assessments
- Reviewing and improving existing processes including:
    - Social records and obligations
    - Grievances and complaints.

17.5 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 centers 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 it is 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.

17.6 Local Procurement and Hiring

The Alcoa procurement system defines "local" as the localities of Dwellingup, Harvey, Pinjarra, Waroona, Coolup, North Dandalup, Jarrahdale 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.

Alcoa also endeavors to add value to Traditional Owners and the local economy through the use of businesses owned by Traditional Owners, businesses that employ and work with Traditional Owners and locally owned businesses. Alcoa will help Traditional Owner businesses and local businesses to do business with Alcoa and encourage the employment of Traditional Owner and local labor and have made a policy commitment to:

- Invite capable local Traditional Owner, Aboriginal and Torres Strait Islander and Local businesses to bid on every locally supplied or manufactured good or service.
- Give preference to Traditional Owner, Aboriginal and Torres Strait Islander and Local businesses in a competitive situation.
- Tender evaluations shall apply a minimum weighting of 10 per cent for Traditional Owner, Aboriginal and Torres Strait Islander and Local businesses.

- Work with Traditional Owner, Aboriginal and Torres Strait Islander and Local business interest groups to identify, utilize and build local supplier capability.
- Offer reduced Payment Terms to support the growth and sustainability of Traditional Owner, Aboriginal and Torres Strait Islander and Local business.

18.0 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.

18.1 Capital Costs

The operation is well-established, and the LOM plan does not envisage any significant change of the production rate over the LOM. Anticipated future major capital expenditure is related to major mine moves and sustaining the on-going operations.

Projected capital expenditure over the next nine years of mine life is estimated to total $603 million. Of this total, $158 million is associated with the completion of the mine move to the Myara North site and $241 million is estimated for the Holyoake move.

A breakdown of the major expenditure areas and other sustaining capital expenditure over the next nine years of mine life (2023 – 2031) is shown below.

Table 18-1: LOM Sustaining Capital Costs by Area

Project	Cost $ Million	Percentage of Total
Mine Moves	399	66.2%
Conveyor Belt Replacements	69	11.4%
Haul Road Improvements	55	9.1%
Other Sustaining capital	80	13.3%
Total	**603**	**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 generally be classified as Class 1 or Class 2 with an expected accuracy range of -3% to -10% to +3% to +15%.

18.2 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.

The operating costs are based on historical actual site cost data and, in the opinion of the QP, represent an accuracy range of -10% to +15%.

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 2023 and average mine operating costs the nine-year LOM are shown below in Table 18-2.

Table 18-2: LOM Mine Operating Costs by Category*

Cost Centre	2023 ($/wmt)	Average LOM ($/wmt)	Percentage of Operating Cost (%)
Direct Labor	$3.43	$4.87	38%
Services	$2.07	$1.88	15%
Other	$1.45	$2.21	17%
Corporate Chargebacks for support services	$0.53	$0.59	5%
Energy	$0.34	$0.37	3%
Fuel	$0.37	$0.67	5%
Operating Supplies and Spare Parts	$0.44	$0.69	5%
Maintenance (fixed plant and mobile fleet	$1.06	$1.67	13%
Mine Operating Cash Cost ($/wmt)	**$9.70**	**$12.95**	**100%**
Off-site Costs			
G & A, selling and other expenses	$0.28	$0.24	
R & D Corporate Chargebacks	$0.03	$0.03	
Total Cash Operating Costs	**$10.01**	**$13.21**	

*Due to rounding, numbers presented may not add up precisely to the totals provided.

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 December 2022, the Huntly and Willowdale operations together employ a total of 887 employees consisting of 48 technical, 77 management and 762 operations employees. Additionally, 67 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	37	50	524	611
Willowdale	11	27	238	276
Central	18	8	41	67
Total	**66**	**85**	**803**	**954**

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)).

19.0 ECONOMIC ANALYSIS

19.1 Economic Criteria

Alcoa prepares a rolling operational Ten-Year Mine plan for the purposes of long-term mine and business planning.

In accordance with the requirements of SK-1300, the economic analysis presented in this section of the TRS is based on mining the estimated Proven and Probable Mineral Reserves, which generate a current mine life of nine years (2023 to 2031 inclusive) at an average production rate of 34.5 Mtpa (dry tonnes).

It is noted that production is driven by refinery requirements rather than mine plan output, so annual fluctuations in mined tonnage are constrained by refinery demand and operation rather than a mining schedule. Therefore, tonnages used in the model are based on forecasted refinery consumption rather than mine plan outputs. The QP is satisfied that this approach is standard operating practice for Alcoa and there is sufficient Proven and Probable Reserve tonnage available to cover the extent of the 9-year model life.

In addition, the QP 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 historical success of Resource to Reserve conversion, the QP sees no reason why the life of the operation will not be extended well beyond 2031.

The assumptions used in the analysis are current at the end of December 2022.

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 12.25% discount rate for DCF analysis. The QP is of the opinion that a 12.25% 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, 2023
Mine Life based on Mineral Reserves	9 years
Average LOM Price Assumption	$21.00
Total Operating Costs	$4,330.6 million
Capital over nine years	$603.2 million
Income tax	$472.5 million
Discount Rate	12.25%
Discounting Basis	End of Period
Inflation	0%

Description	Value
Corporate Income Tax Rate	30%

Table 19-2 provides a summary of the estimated mine production over the nine-year mine life.

Table 19-2: LOM Production Summary

Description	Units	Value
Total ROM Ore	Mt	327.8
Waste Mined	Mt	65.6
Total Material Moved	Mt	393.4
Annual Average Ore Mining Rate	Mtpa	36.4

19.2 Cash Flow Analysis

The indicative economic analysis results, presented in Table 19-3, indicate an after-tax NPV of $463.9 million at a 12.25% discount rate and an average bauxite price of $21.00/t, over the 9-year period.

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 2023 to 2031.

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

Asset	Huntly
Operating Case (Base Data)	Base Case
Price Scenario	WA - Custom

		1	2	3	4	5	6	7	8	9
		30/06/2022	30/06/2023	30/06/2024	30/06/2025	30/06/2026	30/06/2027	30/06/2028	30/06/2029	30/06/2030
	FY22	FY23	FY24	FY25	FY26	FY27	FY28	FY29	FY30	FY31
Key Assumptions										
InterCo Bauxite ($/t)	$19.00	$19.38	$19.77	$20.16	$20.57	$20.98	$21.40	$21.83	$22.26	$22.71
Third Party Bauxite ($/t)	$23.00	$23.50	$24.00	$24.50	$24.50	$25.00	$25.50	$26.50	$27.00	$27.00
Australia (AUD/USD)	$1.28	$1.28	$1.28	$1.28	$1.28	$1.29	$1.29	$1.30	$1.30	$1.31
Brazil (BRL)	$5.48	$5.25	$5.29	$5.33	$5.39	$5.46	$5.53	$5.61	$5.68	$5.75
Tax Rate (%)	30%	30%	30%	30%	30%	30%	30%	30%	30%	30%
Minority Interest (% not owned by Alcoa)	40%	40%	40%	40%	40%	40%	40%	40%	40%	40%
Production										
InterCo Production (Mt)	34,190,501	32,045,204	35,718,266	36,118,370	37,275,149	37,526,957	37,778,450	37,441,247	36,923,130	36,934,145
Third Party Production (Mt)	0	0	0	0	0	0	0	0	0	0
Total Production (Mt)	34,190,501	32,045,204	35,718,266	36,118,370	37,275,149	37,526,957	37,778,450	37,441,247	36,923,130	36,934,145
Income Statement										
Sales	$649,619,527	$621,036,057	$706,064,387	$728,252,961	$766,608,574	$787,223,069	$808,348,738	$817,156,263	$821,965,294	$838,654,732
Cost of goods sold	$350,519,573	$310,683,297	$395,201,830	$495,339,878	$512,232,965	$575,447,040	$573,150,425	$500,002,443	$430,497,874	$450,382,228
Selling, general administrative, and other expenses	$8,272,242	$8,838,834	$8,865,431	$8,865,431	$8,847,735	$8,812,485	$8,777,376	$8,742,406	$8,707,575	$8,672,884
Research and development expenses	$893,590	$954,795	$957,668	$957,668	$955,757	$951,948	$948,156	$944,378	$940,616	$936,869
Provision for depreciation, depletion, and amortizati	$84,540,884	$70,875,065	$85,425,122	$129,360,130	$126,718,540	$121,665,349	$119,733,309	$115,636,417	$111,450,910	$108,878,679
Total costs and expenses	$444,226,290	$391,351,991	$490,450,051	$634,523,107	$648,754,997	$706,876,822	$702,609,266	$625,325,643	$551,596,975	$568,870,659
Income (loss) before income taxes	$205,393,237	$229,684,065	$215,614,336	$93,729,854	$117,853,576	$80,346,247	$105,739,472	$191,830,620	$270,368,319	$269,784,073
Provision for income taxes	$61,617,971	$68,905,220	$64,684,301	$28,118,956	$35,356,073	$24,103,874	$31,721,842	$57,549,186	$81,110,496	$80,935,222
Net income (loss)	$143,775,266	$160,778,846	$150,930,035	$65,610,898	$82,497,503	$56,242,373	$74,017,630	$134,281,434	$189,257,823	$188,848,851
Less: Net income attributable to noncontrolling inter	$57,510,106	$64,311,538	$60,372,014	$26,244,359	$32,999,001	$22,496,949	$29,607,052	$53,712,573	$75,703,129	$75,539,540
Net Income (Loss) Attributable to Alcoa Corpo	$86,265,160	$96,467,307	$90,558,021	$39,366,539	$49,498,502	$33,745,424	$44,410,578	$80,568,860	$113,554,694	$113,309,311
EBITDA	$289,934,121	**$300,559,130**	**$301,039,458**	**$223,089,983**	**$244,572,117**	**$202,011,595**	**$225,472,781**	**$307,467,036**	**$381,819,229**	**$378,662,752**
EBIT	$205,393,237	**$229,684,065**	**$215,614,336**	**$93,729,854**	**$117,853,576**	**$80,346,247**	**$105,739,472**	**$191,830,620**	**$270,368,319**	**$269,784,073**
Statement of Cash Flows										
Income before NCI	$143,775,266	$160,778,846	$150,930,035	$65,610,898	$82,497,503	$56,242,373	$74,017,630	$134,281,434	$189,257,823	$188,848,851
Depreciation, depletion, and amortization	$84,540,884	$70,875,065	$85,425,122	$129,360,130	$126,718,540	$121,665,349	$119,733,309	$115,636,417	$111,450,910	$108,878,679
Working capital change	$484,231	$18,809,748	$3,894,519	$10,729,955	$2,679,216	$20,946,251	-$7,131,191	-$22,861,677	-$13,946,909	$1,669,754
Other (Cash from Operations)	-$50442390	-63,638,365	-$66725066	-$69172310	-$68240990	-$71072005	-$70503752	-$69769309	-$70777867	-$71269875
Cash from Operations	$178,357,991	**$186,825,294**	**$173,524,611**	**$136,528,672**	**$143,654,269**	**$127,781,967**	**$116,115,996**	**$157,286,864**	**$215,983,957**	**$228,127,409**
Distributions to NCIs	-$ 71,343,196	-$ 74,730,117	-$ 69,409,844	-$ 54,611,469	-$ 57,461,708	-$ 51,112,787	-$ 46,446,399	-$ 62,914,746	-$ 86,393,583	-$ 91,250,964
Contributions from NCIs	$19,232,995	$37,701,778	$32,501,176	$33,501,665	$36,040,625	$54,353,485	$21,634,889	$9,154,184	$8,865,583	$7,516,461
Cash from Financing	-$ 52,110,202	**-$ 37,028,339**	**-$ 36,908,668**	**-$ 21,109,804**	**-$ 21,421,083**	**$3,240,699**	**-$ 24,811,509**	**-$ 53,760,562**	**-$ 77,528,000**	**-$ 83,734,502**
Capital expenditures	-$ 48,082,486	-$ 94,254,445	-$ 81,252,940	-$ 83,754,163	-$ 90,101,561	-$ 135,883,714	-$ 54,087,224	-$ 22,885,459	-$ 22,163,956	-$ 18,791,153
Other (Cash from Investing)	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
Cash from Investing	-$ 48,082,486	**-$ 94,254,445**	**-$ 81,252,940**	**-$ 83,754,163**	**-$ 90,101,561**	**-$ 135,883,714**	**-$ 54,087,224**	**-$ 22,885,459**	**-$ 22,163,956**	**-$ 18,791,153**
Consolidated Free Cash Flow	$130,275,505	**$92,570,849**	**$92,271,670**	**$52,774,510**	**$53,552,708**	**-$ 8,101,747**	**$62,028,773**	**$134,401,405**	**$193,820,001**	**$209,336,256**
NPV	**$463,947,047**	$82,468,462	$73,231,121	$37,313,429	$33,731,530	-$ 4,546,183	$31,008,095	$59,854,852	$76,896,716	$73,989,025

19.3 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 costs (Figure 19-1).

NPV $M OPEX	80%	90%	100%	110%	120%
9.00%	$936.97	$738.57	$540.18	$341.78	$143.39
11.00%	$856.01	$673.60	$491.18	$308.77	$126.35
12.25%	$810.71	$637.33	**$463.95**	$290.56	$117.18
13.00%	$785.28	$617.00	$448.72	$280.44	$112.16
14.00%	$753.26	$591.44	$429.61	$267.79	$105.97

NPV $M CAPEX	80%	90%	100%	110%	120%
9.00%	$627.42	$583.80	$540.18	$496.56	$452.93
11.00%	$572.98	$532.08	$491.18	$450.28	$409.38
12.25%	$542.61	$503.28	**$463.95**	$424.61	$385.28
13.00%	$525.60	$487.16	$448.72	$410.28	$371.84
14.00%	$504.21	$466.91	$429.61	$392.31	$355.01

NPV $M Bx Price	80%	90%	100%	110%	120%
9.00%	($91.05)	$224.56	$540.18	$855.79	$1,171.41
11.00%	($89.47)	$200.86	$491.18	$781.51	$1,071.83
12.25%	($88.17)	$187.89	**$463.95**	$740.00	$1,016.06
13.00%	($87.29)	$180.71	$448.72	$716.73	$984.74
14.00%	($86.04)	$171.79	$429.61	$687.44	$945.27

Figure 19-1: Sensitivity Analysis (NPV)

20.0 ADJACENT PROPERTIES

The Darling Range has no material adjacent properties.

21.0 OTHER RELEVANT DATA AND INFORMATION

No additional information or explanation is necessary to make this Technical Report Summary understandable and not misleading.

22.0 INTERPRETATION AND CONCLUSIONS

22.1 Geology and Mineral Resources

- SLR is independently declaring the 31 December 2022 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, 2022, exclusive of Mineral Reserves, as summarized in Table 11-5 at an appropriate level of precision reflecting confidence, the Measured Mineral Resources are estimated to be 44.9 Mt at a grade of 31.2% available alumina (A.Al2O3) and 1.15% reactive silica (R.SiO2). Similarly the Indicated Mineral Resources are estimated to be 51.8 Mt at 31.4% A.Al2O3 and 1.17% R.SiO2, and the Inferred Mineral Resources are estimated to be 140.3 Mt at 32.9% A.Al2O3 and 1.26% R.SiO2.

- 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.

- The QA/QC of sample preparation and assaying is adequate, and the assay results are suitable for use in Mineral Resource estimation.

- 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 QP from the studies on FTIR repeatability discussed above that the overall precision and accuracy of the FTIR assaying is acceptable.

- The database is adequate, and the data is appropriate for the purpose of Mineral Resource estimation.

- The continuous improvements in the geological modelling, estimation techniques, and block model migration to the 3D approach are appropriate and constantly improve the confidence level and precision of the Mineral Resources.

- The dry bulk density data is less well controlled than other analytes, although different attempts were taken since 1980. However, based on the different reconciliation approaches and on the fact that the polygonal and GSM model have lower confidence level, the density values are acceptable for the Resource estimation.

- 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 that the modelling is appropriate for the purpose.

22.2 Mining and Mineral Reserves

- As of December 31, 2022, Proven Mineral Reserves are estimated to total 145.8 Mt at 31.4% A.Al2O3 and 1.17% R.SiO2 and Probable Mineral Reserves are estimated to total 255.8 Mt at 32.4% A.Al2O3 and 1.15% R.SiO2.

- The QP has used the December 31, 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.

22.3 Mineral Processing

- The operating data between 2010 to 2022 indicates that the product from the Darling Range operations consisted of an average A.Al2O3 grade of 33%, with R.SiO2 below the target for refinery feed.

- The QP 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.

22.4 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.
  - 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 74% of the total Department of Water and Environmental Regulation license allocation (for those sites where abstraction occurred). An additional 336,105kL 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.

22.5 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.
- A groundwater monitoring program commenced in H2 2022 across the Darling Range operations to support approvals and operational monitoring.
    - Alcoa will continue to expand its monitoring program, as necessary, if groundwater quality or quantity has been identified as potentially at risk due to operational or 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 have most recently been reported within the 2021 Annual Environmental Review report. Consistent with the outcomes reported between 2018 and 2020:
    - Review of the most recent report, published for 2021 largely reported compliance with environmental commitments and success of operational controls to managed environmental objectives.
- Baseline water quality monitoring has been undertaken at Myara North and Holyoake as part of the Part IV approvals process for these mining areas. It is anticipated that groundwater monitoring will be required as part of the operational license for these deposits.
- Outcomes of and compliance with the management and monitoring programs have most recently been reported within the 2021 Annual Environmental Review report. Consistent with the outcomes reported between 2018 and 2020:
    - Review of the most recent report, published for 2021 largely reported compliance with environmental commitments and success of operational controls to managed environmental objectives.
    - Only a small number of reportable environmental incidents were noted for which corrective actions have been proactively undertaken by Alcoa.

23.0 RECOMMENDATIONS

23.1 Geology and Mineral Resources

It is apparent to the 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 (RPEEE), and the application of constraints establishing forestry, heritage and noise limits to the Mineral Resource definition. 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:

- Continuing to replace the GSM and polygonal areas to the 3D block modelling methodology, using a script-based semi-automated approach, which enables more robust rapid model building. The validation of interpolation parameters using risk-based (conditional simulation) techniques to quantify confidence should be considered.

- To improve the reporting of recoverable resources, a re-blocked block model to a minimum practical mining scale or single mining unit (SMU) should be considered. Economical parameters considering more flexible costs and bauxite prices related to the Mineral Reserves can also be implemented in the Mineral Resources workflow, aiming to optimize the bauxite mineable portion including potential marginal grades.

- Investigate whether the 5% bias in the tonnage between the As Mined and sampling tower weightometers is persistent in the 3D block models.

- Further redrilling or where viable re-assaying of pulps

- 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).

- To include 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 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 QP's opinion, the reintroduction of field duplicates using appropriate riffle splitters under supervision should be considered.
- The QP is of the opinion that the grade characteristics of the bauxite profile could be reproduced in the model, which enables 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.

23.2 Mining and Mineral Reserves

- Currently a dilution and mining recovery factor is applied to the final Reserves to reconcile the tonnes and grade. The 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 mining output that defines Reserves).
- The QP recommends detailed haulage analysis focusing on haulage profiles and cycle times to provide more accurate operating costs.
- The 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.

23.3 Mineral Processing

As mentioned in Section 22.3, the historical operational data for the Darling Range demonstrate that ore consistently met refinery specifications.

Ideally, independent verification of sample analysis is conducted, by a certified laboratory, on a structured program, in order to ensure the QA/QC aspects of the internal analysis. Within this process 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.

The QP is appreciative that the mine is operational meaning a trade-off versus logistics / practicality would need to be carried out.

23.4 Infrastructure

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. The QP makes no recommendations regarding infrastructure.

23.5 Environment

Alcoa has established systems to facilitate adherence to environmental commitments. The QP recommends that the following actions are taken to monitor previously enacted corrective actions, made in response to minor environmental incidents:

- Additional monitoring should be undertaken post-implementation of corrective actions to demonstrate their effectiveness, in particular:

  a. following drainage failures related to significant rainfall events, which resulted in surface water flow from dieback areas into dieback free areas.

  b. following recordings of elevated turbidity for a period exceeding the compliance criteria (25 NTU).

  c. in response to incidents involving PFAS and AFFF contamination

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25.0 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 applicable securities laws, any use of this report by any third party is at that party's sole risk.

26.0 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, 2022 was prepared and signed by:

SLR Consulting Ltd

Per:

/s/ John R. Walker

John R. Walker, FGS, MIMMM, FIQ
Technical Director, Mining Advisory Europe

Dated in UK
February 23, 2023