



pure kiwi mettle

NZAS closure preliminary study

Preliminary closure plan

March 2022

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Abbreviations

DoC	Department of Conservation
DSI	Detailed Site Investigation
ES	Environment Southland
ICC	Invercargill City Council
NZAS	New Zealand Aluminium Smelter
OoM	Order of Magnitude
PANZ	Pacific Aluminium (New Zealand) Ltd
PCMM	Post-closure monitoring and maintenance
PFS	Pre-Feasibility Study
PSI	Preliminary Site Investigation
SCL	Spent cell lining

1 Executive summary

The NZAS Closure Study was shaped as a two-phase programme in response to the potentially time-constrained pathway to New Zealand Aluminium Smelter (NZAS) closure during the 2019/2020 NZAS strategic review. The Preliminary Study is the first of the two phases and was focused on items that represented high uncertainty or closure cost (demolition, spent cell lining (SCL) and waste management). The Preliminary Study explored a range of possible closure options through a structured multi-criteria analysis process. An output of the Preliminary Study is the development of a central case which outlines the plan and assumptions for NZAS closure based on the information currently available and closure date of December 2024.

Rio Tinto and NZAS consider closure planning to be an iterative process of continued improvement. It is important to note that this preliminary closure plan produced from the Preliminary Study is not final and that further work, including significant stakeholder engagement and a Final Study, is required for NZAS to develop and confirm the final closure plan.

The central case assumes the following:

1. All SCL (including encapsulated SCL) will be removed from site and recycled in the cement and salt slag industries. This is intended to be achieved via direct export to various international locations and/or via an onsite processing plant by a third-party contractor, rendering the SCL non-hazardous and able to be shipped overseas for recycling in the cement industry. NZAS is seeking to accelerate the removal of SCL independently of the closure date.
2. Relocation of the existing landfill to a new lined and capped landfill (at higher elevation) on the Tiwai site to address the long-term risk of coastal erosion and sea level rise.
3. Demolition of the majority of assets with foundations removed to -1.5 metres.
4. Remediation of contaminated soils to an industrial level to retain optionality for divestment of freehold land to a next land user, with the intention that an industrial future land use will be identified in due course.

Rio Tinto sees a positive pathway for New Zealand's Aluminium Smelter (NZAS) to continue operating and contributing to the local and national economies beyond 2024. We are currently working closely with Ngāi Tahu, Southland and key industry leaders to find the best way to achieve this.

Regardless of the closure date, Rio Tinto and NZAS are committed to remediating the site and expediting the removal and processing of waste and will continue to progress this work while the site is operating.

2 Background

NZAS is located in Southland on the Tiwai Peninsula across the harbour from Bluff (Figure 1) and is New Zealand's only aluminium smelter. NZAS is a joint venture company owned by Pacific Aluminium (New Zealand) Ltd (79.36 per cent) and Sumitomo Chemical Company Limited of Japan (20.64 per cent). The smelter is managed by Rio Tinto and operates 24 hours a day, seven days a week. NZAS is a tolling plant which undertakes smelting and casting of primary aluminium and its alloys in the form of ingot, billet and rolling block with capacity to produce approximately 368,000 tonnes of aluminium per annum.

NZAS is the largest single electricity user in New Zealand (approximately 622MW per year). The New Zealand Government built the Manapōuri Power station to provide hydro-electricity to NZAS via the national grid. NZAS offers grid stability by providing consistent baseload into the system.



Figure 1: NZAS location

NZAS uses the Hall-Héroult process to reduce alumina to aluminium metal. NZAS has four reduction lines. Potlines 1 and 2 were commissioned in the 1970s and Potline 3 was commissioned in the early 1980s. Potline 4 was commissioned in 1995. A wharf and ship unloader are located to the west of the smelter site and are used for unloading alumina and coke. Pitch and heavy fuel oil (HFO) are imported to site via pipelines from the wharf to site. Alumina, coke, liquid pitch and HFO are stored on site in sheds and tanks. Carbon anodes are formed in the green carbon paste plant. These are then baked in oil-fired ovens (carbon bake furnaces) to improve physical and electrical properties. There are two operating carbon bake furnace buildings. Used anodes (butts), are crushed and used in the production of new anodes, along with petroleum coke and liquid pitch. Aluminium ingots are cast in the metal products area. There are two vertical direct chill casting machines for producing value-added alloys in the form of billets and blocks. Each casting line has associated molten metal holding furnaces.

NZAS is directly connected to the national grid. The 220kV power lines enter the site via a Transpower-owned switch station from which power is transmitted, via overhead pylons and underground cables, to transformers in the switchyard. Power is reticulated via overhead and underground lines.

Process and drinking water for NZAS is extracted from the Tiwai aquifer via six production bores located on leased land to the east of the smelter. Extracted water is pumped to an enclosed reservoir for distribution to site.

NZAS operates a Class B landfill. Class B landfills have limited or no engineered systems to collect landfill leachate or gases. The NZAS landfill has been operational since construction of the smelter commenced in 1969.

The landfill is approved to take the following wastes in accordance with a resource consent issued by Environment Southland:

- non-classifiable waste (non-hazardous material that is not biodegradable);
- clean fill (bricks, concrete, gravel);
- waste carbon (contaminated carbon that cannot be recycled into anode blocks);
- asbestos;
- man-made mineral fibre; and

- dross.

The consent for NZAS landfill is set to expire on 8 December 2023.

In late 2019, Rio Tinto announced it was conducting a strategic review of the NZAS operations. The strategic review considered future pathways for the site, including continued operations, partial or full curtailment, or to cease operations and permanently close the smelter.

In July 2020, at the conclusion of the strategic review of operations, Rio Tinto announced a termination of the existing power contract and a proposed closure of NZAS at the end of August 2021. Ongoing engagement through the second half of 2020 saw a January 2021 announcement of a new power agreement with Meridian Energy Limited to the end of December 2024.

In May 2021, Rio Tinto Chief Executive, Jakob Stausholm, and Rio Tinto Aluminium Chief Executive, Ivan Vella, visited New Zealand and made a number of commitments to the Prime Minister in respect to NZAS' environmental waste management. These commitments included that NZAS will assume responsibility for the removal and processing of the Ouvea Premix material, will remove all SCL from the Tiwai peninsula at closure, and will remove and process the buried Haysom's dross on site.

Given the potential of early closure following the strategic review, a two-phase study approach was recommended and adopted instead of Rio Tinto's usual three-phase study process (Order of Magnitude (OoM), Pre-feasibility Study (PFS) and Feasibility Study). The first phase is referred to as the NZAS Closure preliminary study (Preliminary Study) and is presented in this closure plan. The second phase will be referred to as the NZAS Closure Final Study (Final Study) and is proposed to commence in January 2023 for completion in September 2024, based on the current closure date of December 2024.

As a producer of some of the highest purity, lowest carbon aluminium in the world, NZAS is well placed to supply economies focused on decarbonisation. NZAS also has the potential to play a significant role in helping New Zealand's electricity system manage dry year security of supply and, with other emerging industries, to enable the development of more renewable generation.

With a global strategy focused on decarbonisation and growth (released in October 2021), Rio Tinto sees a positive pathway for New Zealand's Aluminium Smelter (NZAS) to continue operating and contributing to the local and national economies beyond 2024. Rio Tinto and NZAS are working closely with Ngāi Tahu, Southland and key industry leaders to find the best way to achieve this.

Regardless of the closure date, Rio Tinto and NZAS are committed to remediating the site and expediting the removal and processing of waste and will continue to progress this work while the site is operating.

3 Tenure and domains

The smelter is located on freehold land owned by NZAS. The smelter area is surrounded by freehold land owned by Pacific Aluminium (New Zealand) Limited. The NZAS landfill, Haysom's dross landfill, and SCL storage pad are located on PANZ land. The six production bores to the east of the smelter site are located on land leased from the Department of Conservation (DoC). NZAS holds a licence from Southport New Zealand Limited in respect of its wharf facilities that continues until its expiry in 2043.

The Preliminary Study uses the following six domains and sub-domains to define, study and conduct trade off analysis on various closure options (refer to Figure 2):

- | | |
|-------------------------------------|-------------------------------|
| (1) Smelter | (4) Landfill |
| (2) Wharf | (5) Rio Tinto Freehold |
| (3) Spent Cell Lining Storage (SCL) | (6) Rio Tinto Leasehold (DoC) |

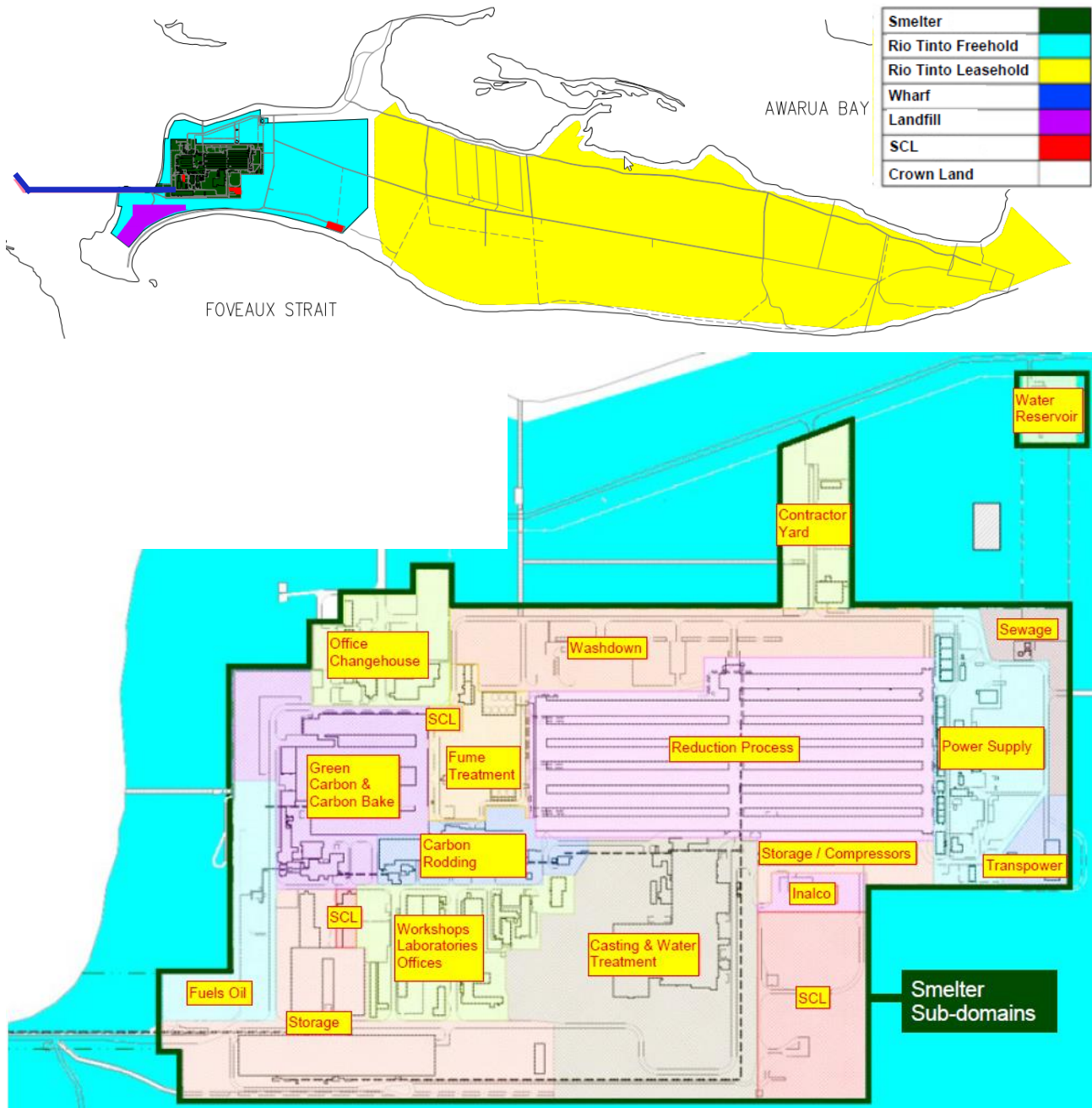


Figure 2: Preliminary study domains and Smelter Domain sub-domains

4 Study findings

4.1 Knowledge base

GHD, a global professional services company, was engaged by NZAS as the technical services provider for the preliminary closure study. To build on existing environmental knowledge of the NZAS site and surrounds, GHD undertook the following studies during the Preliminary Study:

- Contaminated sites
- Hazardous materials and wastes
- Hydrology and hydrogeology
- Ecology
- Rehabilitation and revegetation
- Coastal erosion and sea-level rise
- Climate change
- Air quality
- Noise and vibration

Key studies that influenced the central case were the coast erosion and sea-level rise assessments and the contaminated sites assessment.

GHD concluded from their preliminary assessment (*Sea level rise impact assessment*) that sea levels are somewhat relevant to the future planning at Tiwai Point. While the risks of sea level inundation are reasonably low at present, there are plausible future events that modelling shows could result in higher sea level. Wave and storm surge inundation can reasonably be anticipated on significant parts of the site within 100-200 years. Daily inundation of parts of the existing developed flat land and inundation of all of the existing developed flat land by a 20 to 50-year storm event could be expected within 200-1000 years.

A contaminated sites Preliminary Site Investigation (PSI) was completed. Conceptual site models for the peninsula were developed based on the understanding of known and potential sources of contamination and the operational history NZAS. The PSI identified potential contaminants of concern from smelting operations including aluminium, fluoride, cyanide, sodium, chloride, vanadium, total petroleum hydrocarbons, phenolics, asbestos, poly-fluoroalkyl substances (PFAS), polychlorinated biphenyls, semi volatile organic compounds/volatile organic compounds, faecal coliforms, nutrients, heavy metals and organic compounds. The PSI describes the potential pathway from the sources to potential receptors and was used assist in developing the sampling plan for the subsequent *Detailed site investigation* (DSI).

The DSI found 1% of the soil samples did not meet the criteria for commercial industrial land use and 9% did not meet the criteria for recreational land use. Impacts in soils were predominantly in shallow, near surface soil samples, with slightly deeper samples at 1.0m typically being compliant with applicable regulatory criteria. Of note was the lack of criteria exceedances for some of the key contaminants of concern identified in the PSI. Cyanide, asbestos and PFAS chemicals were not measured at concentrations in excess of criteria for a commercial industrial or recreational land use. Exceedances of criteria were predominantly fluoride, polycyclic aromatic hydrocarbons (PAHs) and aluminium. Less frequent, more isolated locations of impact were associated with arsenic, vanadium, lead and hydrocarbons. All three of the site drains (North, West and South Drain) were found to have impacted sediments that exceeded the applicable sediment criteria. The register of contaminated sites has been updated and includes a total of 93 sites of known or potential contamination. A detailed copy of the register is included in the appendices of the DSI report.

4.2 Central case

A proposed date for the cessation of operations at NZAS of 31 December 2024 is assumed for the purposes of this preliminary closure plan, providing a lead time of three years for operational ramp down, early works, and the Final Study. Closure execution activities are estimated to take 10 years post cessation of operations.

The Preliminary demolition plan assumes that decontamination activities would be undertaken by NZAS Operations prior to closure execution activities commencing as per the Preliminary decontamination plan. The Preliminary decontamination plan defines the strategies for the removal and management of hazardous materials (HAZMAT) during the NZAS closure program. HAZMAT removal activities involve the controlled physical removal of hazardous materials and wastes from surface and subgrade infrastructure, including buildings and structures, plant/ equipment, storage facilities, and pits/ sumps. The goal is to either remove the HAZMAT completely for safe disposal, or to decontaminate the parent structures to the extent that they can become non-hazardous wastes for disposal or recycling.

Liberty Industrial, a provider of specialist decommissioning, deconstruction, remediation, civil contracting, and industrial services, was engaged to provide demolition expertise for the preliminary closure study. The Preliminary demolition plan sets out the proposed method and resources for undertaking the demolition and associated works during the NZAS closure program. The demolition scope includes:

- Removal of residual hydrocarbon, solidified pitch, and other contaminants within structures, pipes, vessels, and mechanical/ electrical equipment
- Hazardous material (HAZMAT) removal and disposal
- Solidified residue pitch removal and disposal
- Verification of isolations
- Engineering (explosive demolition and induced collapse, lift studies, and engineering calculations for demolition methodologies)
- Surface water management (erosion and sediment control)
- Aboveground demolition of structures
- Demolition of concrete and underground services to a maximum of 1.5 m below ground level (mbgl)
- Processing of scraps for off-site disposal/ recycling by others
- Identification and protection of assets to be temporarily or permanently retained

The Preliminary demolition plan assumes services disconnection/relocation and elimination of stored energy following make-safe works would be completed prior to commencement of the demolition program. Pre-demolition work to be conducted by the demolition contractor prior to commencement of demolition activities would include inspections and surveys, enabling works and removal of residual bulk materials and chemicals not removed during ramp-down.

The demolition sequence of work would be as follows:

- Preliminaries – including mobilisation of plant to site, onboarding of personnel, setting up of site amenities, verification of disconnections and zero energy, development of management plans, and preparation of Work Method Statements
- Enabling Works – including make-safe/decontamination/de-energisation activities, and clearing/grading of laydown areas
- Aboveground demolition – demolition of structures to ground level utilising mechanical, high-reach, soft stripping, or explosive methods. Stability of structures would be maintained at all times to eliminate the risk of falling objects. Standoff distances and safe reach angles for excavators would be enforced. During deconstruction, the structural integrity of residual structures would be maintained

at all times. All items being lifted would have the structural integrity to remain intact during the lifting process.

- Belowground demolition – demolition of concrete and underground services to 1.5 mbgl. In the case where footings extend marginally beyond 1.5 mbgl, the entire footing will be removed. A pulverizer will be used to demolish concrete and delaminate rebar. Un-contaminated concrete will be crushed to -50 mm for re-use as clean fill.
- Disposal – the disposal of general waste, HAZMAT, and other demolition waste not suitable as clean fill will take place progressively throughout the demolition phase.

In the pre-closure phase, a new source of power (via a new 33 kV supply from PowerNet's Colyer Road Substation) and raw water (via a new water extraction bore on freehold land) would be implemented for dross and SCL processing. Communications, surveillance and lighting systems, fuel and compressed air supply, sewage infrastructure, security fencing and gates, and buildings would be modified or refurbished in the pre-closure phase.

The six existing water extraction bores and the associated salinity monitoring bores, pipelines and overhead power lines on leasehold land would be decommissioned after the completion of operational ramp down. Above ground infrastructure would be demolished while bore casings and pipelines would remain buried, if agreed upon by the DoC. Leasehold land would be relinquished by the end of 2029, assuming sufficient bore water can be supplied from freehold land for closure execution purposes. The new water extraction bore and standpipe would remain in service and be connected to the new 33 kV supply until the end of the post-closure monitoring and maintenance (PCMM) period.

The existing sewage field would be decommissioned and remediated as required. Haysom's dross and the SCL Pad will be excavated along with contaminated subsoil (an average depth of 1m across the footprint of the SCL pad is assumed). The excavated/disturbed areas will be backfilled, graded, and revegetated. The SCL pad effluent treatment plant will remain operational until towards the end of the demolition period (powered by a genset and diesel tank during the demolition period of three years), to continue collecting/treating contaminated water until the concrete slab and contaminated subsoil is removed. The existing onsite wash-down facility and SCL pad effluent treatment plant would also be utilised for demolition wash-down and wastewater collection/treatment.

It is assumed the existing landfill would be excavated along with contaminated subsoil (an average depth of 1m across the footprint is assumed). Waste materials and subsoil would be chemically stabilised and placed in the new Class A on-site landfill. The excavated/disturbed areas would be backfilled, graded, and revegetated.

A borrow pit (notionally 2m deep across a footprint of 247,463m²) would be established in freehold land at the location of the new on-site landfill to provide 478,214m³ of backfill as well as drainage and capping materials for the new landfill. The *Ecology environmental study report* included a map of ecological values based on a site survey. Avoiding the use or disturbance of "high value", "seasonally very high value", and "very high value" areas formed a key consideration when selecting the location of borrow pit and new on-site landfill. The *Geology report* provides a review of existing soils and geology information of the Tiwai peninsula, which is predominantly comprised of Quaternary unconsolidated beach deposits comprised of beach (pea) gravels and sands. The development of surface soils across Tiwai Peninsula is limited, with the majority of the site having only a thin layer of soil covered by grasses and shrubs. A detailed assessment of the available onsite growth medium that could be borrowed for post-rehabilitation will be completed as part of the Final Study. This would include assessment of soil fertility and organic matter content, focusing on growth medium located in the areas proposed for borrow material.

A variety of materials would be imported as required for site remediation and revegetation, and to construct the new 860,103m³ landfill with an estimated footprint of 234,146m² and a maximum RL 7.5m. The borrow pit and the new landfill cap would be revegetated. The leachate collection system at the base of the new landfill would be connected to the new 33kV supply. Leachate would be pumped out periodically, analysed, and

treated off-site if required. The new landfill (lined and capped), along with all remaining retained land and assets, would be monitored and maintained until the end of the PCMM period.

Upon completion of dross and SCL processing, all remaining live services within the Smelter Domain (including the new 33 kV feed and bore water supply) would be decommissioned. The Smelter Domain would be fully demolished to a maximum depth of 1.5 m based on the demolition strategy described in the Preliminary demolition plan. Contaminated soil and sediments would be removed, chemically stabilised, and placed in the new on-site landfill, along with non-recyclable demolition wastes that are able to be landfilled. The treatment of recyclable and contaminated materials, hazardous material, controlled wastes, and dangerous goods would be guided by the Preliminary decontamination plan and the Preliminary waste management plan. The Preliminary decontamination plan defines the strategies for the removal and management of hazardous materials and the Preliminary waste management plan describes the objectives, requirements, facilities, scope, responsible parties, timing, activities, and closure provisions associated with waste management. Crushed clean fill, composed of uncontaminated concrete and bricks, would be used to backfill demolition and soil remediation voids as well as open drains. Any shortfall in backfill material would be made up by borrowed pea gravel. The ground would be reprofiled to tie into the existing ground levels (notionally RL 3.5 – 4.7 m) without revegetation or the need to create new drainage channels, as the crushed clean fill and borrowed material (sandy pea gravel) have a high surface water infiltration capacity.

The CCG (Composite Contractor Group) Workshop would serve as the future gatehouse until it is demolished. A new water tank (topped up by bore water trucked in from the new water extraction bore), localised firewater system, demountable office/ablution facility, diesel tank, and two gensets would be set up at the gatehouse area ahead of demolition. These, as well as perimeter fencing, solar lighting, and solar/ wireless security cameras, would remain operational until the end of year 15, when the Smelter Domain is assumed to be divested to a new owner.

Above-deck assets in the Wharf Domain owned by NZAS will be demolished. Ahead of demolition, a new water tank (topped up by bore water trucked in from the new water extraction bore), diesel tank, and two gensets would be set up at the start of Wharf causeway, along with modified power reticulation systems out onto the wharf deck. If required by South Port, these would continue to service South Port's Wharf and harbour beacons until the end of the wharf license period on 20 April 2043.

Key milestones associated with the central case are as follows:

2022-2024 Pre-closure (three years)

- Jan 2022 – Dec 2024 Closure readiness and ramp down planning
- Jun 2022 – Dec 2024 Early works engineering and execution support
- Jan 2023 – Sep 2024 Final Study
- Mar 2023 – Oct 2024 Early works execution
- Dec 2024 Termination of 220 kV power supply contract

2025-2034 Closure execution (Year 1 to Year 10)

- Jan 2025 Commencement of closure execution (start of Year 1)
- Jan 2025 – Jul 2030 Dross and SCL processing (Year 1 – Year 5.5)
- May 2029 – Aug 2034 Earthworks execution (Year 4.5 – Year 10). Includes creation of a new landfill at a higher elevation and relocating waste in existing landfill to the new landfill
- Dec 2029 Leasehold land relinquished (end of Year 5)
- Jan 2031 – Dec 2033 Demolition execution (Year 7 – Year 9) includes full demolition of NZAS owned infrastructure to a maximum depth of 1.5m below ground level, after the completion of on-site SCL and dross processing activities in year 2030

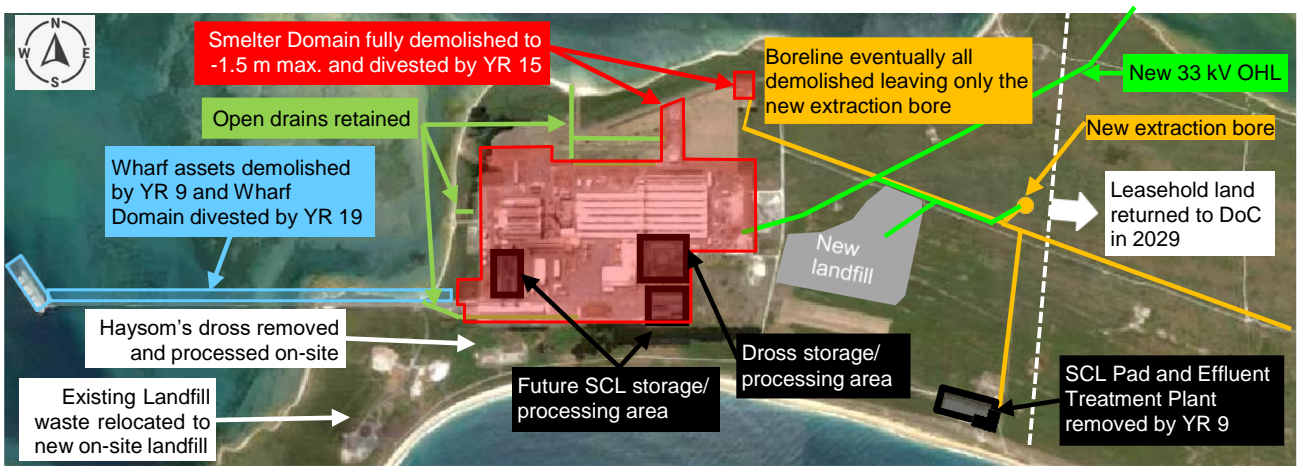
- Dec 2034 Completion of all closure execution activities (end of Year 10)

2025-2043+ PCMM

- Jan 2025 Commencement of PCMM activities (start of Year 1)
- Jan 2025 – Dec 2039 Smelter Domain PCMM (Year 1 – Year 15) then assumed divestment to new owner in 2039
- Jan 2025 – Apr 2043 Wharf Domain PCMM until expiration of Wharf licence
- Apr 2043+ PCMM for remaining retained areas

The proposed timing and sequence of works (especially during the Pre-closure phase) would depend on the confirmed termination date of the existing 220 kV power supply contract as well as operational ramp down activities.

An overview of the central case is shown in Figure 3.



Source: Preliminary continuity of services and de-energisation plan

Figure 3: Central case overview

4.3 Closure strategic assumptions

The key strategic assumptions underlying the central case preliminary closure strategy are:

1. Cessation of operations of NZAS is December 2024.
2. Central case scope will be accepted by relevant stakeholders (including Te Runaka O Awarua as mana whenua, Ngāi Tahu, our neighbouring communities and Environment Southland).
3. Stakeholder engagement with Te Runaka O Awarua as mana whenua, Ngāi Tahu, our neighbouring communities and other relevant stakeholders will continue in the leadup to closure to confirm closure objectives and criteria.
4. Approvals and consents for closure execution will be applied for and granted in a timely manner.

4.4 Regulatory framework

New Zealand's Resource Management Act 1991 (RMA) is currently the primary legislation governing the use of land, water and air resources. Under the RMA, decision-making has been decentralised to local levels (territorial authorities) and regional levels (regional councils) in most cases. NZAS is located within the Invercargill City Council (ICC) (with ICC being the territorial authority) which is within the jurisdiction of Environment Southland (ES) (the Southland regional council). Activities at NZAS must comply with the ICC District Plan and are also subject to consents from ES.

With the exception of the concessions relating to the wharf operations and DoC land, the land on which the majority of the smelting operations are conducted are contained within freehold land owned by either NZAS or PANZ. Notwithstanding any cessation of smelting activities, the wharf licence agreement will continue until 2043. Under this agreement, NZAS shall be responsible for all repair and maintenance of the wharf and access bridge (and associated infrastructure) until the expiry of the agreement. A DoC concession is held for crown land around Tiwai wharf that is used for associated infrastructure. The concession will continue despite cessation of smelting activities. Easements on crown land are also leased by PANZ and used for borelines, effluent pipeline and other infrastructure. The easements will also continue despite cessation of smelting activities.

Many approvals and consents will be required for closure execution activities related but not limited to demolition, earthworks, landfill, discharges and export of hazardous waste.

Ngāi Tahu is the principal Māori iwi (tribe) of the South Island. Its tribal area is the largest in New Zealand and encompasses a significant part of the South Island. Iwi interests and cultural values/impacts are a relevant consideration in all (for example) RMA decision making processes, and consultation will be a required feature of any resource consent applications or change of permitted land use applications that may be required to be made as part of any closure process.

4.5 Social impacts and stakeholder engagement

Critical stakeholders include:

- NZAS employees and on-site contractors,
- Te Rūnanga o Awarua (mana whenua of Tiwai Point),
- Te Ao Marama Inc (the authorised representative body of four Iwi tribes for Southland, for Iwi consultation on resource management and environmental issues),
- Te Rūnanga o Ngāi Tahu,
- local businesses and suppliers,
- the Southland community,
- Environment Southland,

- Invercargill City Council,
- South Port NZ Ltd (the owner of the wharf),
- Department of Conservation, and
- Ministry for Environment.

Stakeholder engagement on closure scope to date has aimed to provide transparency on the preliminary closure study process and commit to further engagement with stakeholders on closure outcomes prior to decisions being made. While presentations to stakeholders have introduced key closure scope items such as landfill, contamination, remediation and demolition, tactical engagement on reaching a shared understanding of closure outcomes, future land use, and closure criteria with key stakeholders is yet to occur. Engagement and consultation with stakeholders will continue as NZAS prepares for closure.

In 2020 NZAS engaged consultants GHD to undertake a socio-economic baseline study and a socio-economic impact assessment (SEIA) for the proposed closure of NZAS. Engagement was undertaken with a range of NZAS stakeholders to inform the 2020 baseline and SEIA. Engagement was repeated in May and June 2021 to re-engage with NZAS stakeholders who were consulted for the 2020 SEIA, to provide the outcomes of 2020 SEIA, and to discuss impacts of potential closure of NZAS in 2024. The outcomes of the 2021 engagement are presented in *Closure Socio-economic Impact Assessment Report*.

Data from 2019 indicates that of the 986 direct NZAS employees and contracting workforce, almost all live in the Southland region, including 92.4% in Invercargill. The Southland region has a population of 97,467, which was about 2% of New Zealand's population. Approximately 15% of the Southland region is Māori. Around half of the region's population (54,204) live in Invercargill City, the largest city in the region and the commercial, services and civic hub. NZAS is the largest single-site employer in Southland and is recognised as an important employer and a critical and stable anchor for local businesses in the manufacturing and engineering sector.

Potential socio-economic impacts and opportunities for NZAS closure include regional economic impacts (loss of employment, income and revenue), demographic change, impacts to community infrastructure and services, impacts to regional businesses and local supply-chain and impacts on community values, well-being and cohesion. A range of potential mitigation strategies and actions have been identified in the SEIA to:

- Manage direct and indirect impacts on employees and their families.
- Ensure a positive legacy for NZAS in Invercargill and Bluff.
- Encourage communication and collaboration with key stakeholders and partners in the region.
- Manage impacts on local and regional businesses, and local service providers.

Mitigation strategies will require further consideration through stakeholder engagement.

An update to the socio-economic baseline and impact assessment is proposed following the next New Zealand (NZ) Census in 2023. The socio-economic baseline and impact assessment outcomes will continue to be shared with stakeholders to ensure that the community is as fully informed as practical on closure and its potential impacts.

4.6 Cultural heritage

Rio Tinto and NZAS acknowledge Te Rūnaka O Awarua as mana whenua of Tiwai Peninsula. Work is currently underway to update the NZAS Cultural heritage management system (CHMS) Plan in partnership with Awarua. This plan sets out obligations in managing cultural heritage on the freehold land on the Tiwai Peninsula. NZAS works closely with Iwi and government organisations and other interested parties to ensure appropriate management of cultural heritage places.

NZAS adheres to the criteria set out by Heritage New Zealand:

- The Heritage New Zealand Pouhere Taonga Act 2014 defines an archaeological site as a place associated with pre-1900 human activity, where there may be evidence relating to the history of New

Zealand. A place associated with post-1900 human activity may be declared by gazettal as an archaeological site under the Act.

- The Heritage New Zealand Pouhere Taonga Act 2014 makes it unlawful for any person to modify or destroy, or cause to be modified or destroyed, the whole or any part of an archaeological site without the prior authority of Heritage New Zealand. Anyone wishing to do any work that may affect an archaeological site must obtain an authority from Heritage New Zealand before any work begins.

NZAS also works closely with the Department of Conservation on ensuring to ensure appropriate management of cultural heritage places.

There are currently 31 cultural heritage places identified and registered on the Tiwai Peninsula, and include middens/ovens, burials places and an adze workshop, and European burial sites and structures. A further archaeological survey of the peninsula will be completed in Q1 2022 to review and update this information.

4.7 Waste management

4.7.1 SCL and dross residues

NZAS currently has approximately 220,000 tonnes of SCL stored on site in SCL storage sheds and the SCL Pad. The SCL Pad (also known as Spent Cathode Pad) contains historical SCL stockpiled on top of a concrete pad, located around 90m from the shoreline. An Effluent Treatment Plant located next to the pad treats the leachate from the area, and discharges treated effluent in restricted rates into the Foveaux Strait via outgoing tide. The proximity of the SCL Pad to the coastline has attracted public attention, stemming from the perceived risk of coastline erosion as well as the threat of sea level rise over the longer term.

NZAS currently has approximately 55,000 tonnes of dross residue products (Ouvea, metal reclamation product (MRP) and Haysom's). Approximately 21,500 tonnes of Ouvea will be stored securely in shipping containers prior to processing and removal from site. Approximately 13,500 tonnes of Haysom's and 20,000 tonnes of MRP dross is landfilled at NZAS. This dross will be recovered from the landfill, processed and removed from site.

NZAS has launched projects to accelerate the removal of SCL and dross as an operational priority independent of the closure date. In both cases, acceleration is via a combination of direct export and on-site treatment processes.

The central case assumes all SCL (including encapsulated SCL) will be removed from site and recycled in the cement and salt slag industries. This is intended to be achieved via direct export to various international locations and/or via an onsite processing plant by a third-party contractor, rendering the SCL non-hazardous and able to be shipped overseas for recycling in the cement industry. If feasible, the installation of an onsite processing plant would increase the rate of removal of SCL from site from 5,000 – 6,000 tonnes per annum (historical average) to 30,000 to 40,000 tonnes per annum. Sampling of the SCL Pad will be performed in 2022 to inform whether an economically viable technical solution for the treatment of this material is available. Further engagement with Environment Southland, Iwi, community and key stakeholders will be required if NZAS cannot identify a viable option. Alternative options include relocating the material currently stored on the SCL pad to a local offsite landfill which is purpose built and licenced to receive the waste.

4.7.2 Process material

Process material requiring management at closure includes carbon fines, pitch, alumina, crushed butts, butt bath and tapped bath. During operational ramp down, the inventories of process materials will be controlled carefully to consume as much of these on-site as possible prior to cessation of smelting. The remaining process material is planned be sent to another Rio Tinto smelter for re-use.

4.7.3 Hazardous waste

The assumed quantities of hazardous materials at closure and their management are detailed in the Preliminary decontamination plan. Hazardous wastes to be managed at closure include asbestos containing materials, ozone depleting substances, transformer oil, fuel and oils, bulk chemicals, residues (subgrade pits, sediment and sludge) and man-made mineral fibre. At closure, all hazardous materials will be recycled or disposed of in accordance with New Zealand regulations which may include disposal in the new onsite Class A landfill or taken off-site by specialist waste collection contractors.

4.7.4 Operational landfill strategy

NZAS is progressing a project to cease waste being deposited at the onsite landfill and plan for the closure of the landfill. NZAS has forwarded a request for proposal to multiple suitably qualified and experienced contractor organisations to manage all new waste arisings and transfer these to appropriate off-site certified and approved landfills and recycling centres.

4.8 Post-closure management

Post-closure monitoring and maintenance (PCMM) requirements will be guided by the requirements of future resource consents required for the site as well as closure criteria. Preliminary plans have been developed for environmental aspects and infrastructure. The Environmental PCMM plan details environmental monitoring and management required for the pre-demolition, demolition, Smelter Domain asset retention period, and post-demolition and rehabilitation period. These plans will be refined during the Final Study.

4.9 Alternative Closure Options

The alternative closure options differ to the Central Case in three main ways:

1. the SCL pad could be relocated to a local offsite landfill which is purpose built and licenced to receive the waste;
2. the NZAS landfill could be retained in its current location with installation of an engineered cap and engineered erosion control; and/or
3. reduced demolition and/or concrete building slabs could be left in situ.

Sampling of the SCL Pad will be performed in 2022 to inform whether an economically viable technical solution for the treatment of this material is available. Further consultation with Environment Southland, Iwi, community and key stakeholders will be required if NZAS cannot identify a viable option. Alternative options include relocating the SCL pad to a local offsite landfill which is purpose built and licenced to receive the waste. Under this option, SCL stored in sheds would continue to be exported for recycling following the existing pathways. The SCL Pad material would be excavated, chemically stabilised, and taken to an off-site landfill within Southland. The SCL Pad Effluent Treatment Plant would remain operational until towards the end of the demolition period (powered by a relocated existing genset and diesel tank during the 3-year demolition period), to continue collecting/ treating contaminated water until the concrete slab and contaminated subsoil is removed. The existing wash-down facility and SCL Pad Effluent Treatment Plant would also be utilised for demolition wash-down and wastewater collection/treatment. Stakeholders will be further engaged as this work progresses prior to decisions being made.

Further work is required to understand the net environmental impact of relocating the landfill versus leaving the landfill in its current location. The outcome of this may be that the NZAS landfill is retained in place with an engineered cap and engineered erosion control. Under this option, the existing Landfill would be shaped, capped, revegetated, and provided with a new freshwater injection and leachate collection/ treatment system as well as rock armour along the south-east boarder for increased erosion protection. As the existing landfill is unlined, demolition and waste and contaminated material cannot be added due to concerns of environmental impact. Therefore, a new on-site landfill, lined and capped, would be required for this material. It would be located in a similar position to the new landfill proposed in the Central Case but would cover a smaller footprint

due to the smaller volumes of waste required to be encapsulated. Stakeholders will be engaged further prior to decisions being made.

The Tiwai site has unique attributes which make the site attractive for repurposing to another industrial use. Pending the future land use, some buildings and/or slabs, roads, and hardstands may be retained for reuse. Stakeholders will be engaged further prior to decisions being made.

5 Human resources

NZAS currently employs approximately 1,000 direct NZAS employees and on-site contractors. Workforce numbers are expected to reduce following cessation of operations with a small number being retained to support post-decommissioning closure execution activities.

Supporting employees' transition is critical to closure and leaving a positive legacy. The My Future Plan (MFP) program which has been successful at other closing Rio Tinto sites, would also be applied at NZAS. The program is designed to support employees with preparations for transitioning to their desired future after operations cease. The program provides employees the opportunity to develop personal plans for achieving their goal of:

- transitioning to future employment with another employer;
- seeking redeployment for future employment at another Rio Tinto operation or location;
- establishing their own business; or
- transitioning to retirement.

NZAS aims to equip employees with the knowledge and skills to successfully transition from their current employment to their desired future outcome. This would be supported through training, re-training and/or upskilling, traditional outplacement services, brokering and support to connect with future employment opportunities and connection with subject matter experts to provide tailored advice for commencing small businesses or retirement planning.

6 Costs

Rio Tinto engaged GHD Pty Ltd to prepare a closure cost estimate as part of the preliminary closure study. The NZAS rehabilitation and closure provision will be updated and included in the New Zealand Aluminium Smelters Limited Annual Financial Report for the year ended 31 December 2021 in May 2022.

7 Closure Readiness

Regardless of the closure date, Rio Tinto and NZAS are committed to remediating the site and expediting the removal and processing of waste and will continue to progress this work while the site is operating. This includes the following activities:

- ongoing engagement with stakeholders,
- identifying and addressing possible sources of contamination,
- removal and recycling of SCL,
- removal and recycling of dross (Ouvea, Haysom's and MRP),
- removal and recycling of other smelting by-products,
- progressive remediation of contaminated areas, and
- closure of the onsite landfill.

8 Final study execution plan

The study scope will include the following activities:

1. Re-confirm that the central case defined by the 2021 Preliminary Study is the appropriate strategy going forward prior to the commencement of the Final Study
2. Complete study activities to Feasibility level, in order to:
 - a) Develop the selected option for closure execution including demonstration of regulatory approval and stakeholder acceptance
 - b) Demonstrate ability to comply with all legal and constructive obligations
 - c) Define the final closure option consistent with NZAS' closure objectives
3. Prepare a Feasibility Level detailed engineering and design for closure execution
4. Define closure readiness, asset transition and post-closure management plans
5. Conduct governance and assurance activities as required

The Final Study is proposed to commence in January 2023 and be complete by September 2024, based on the current closure date of December 2024.

Document references

Document title

Sea level rise impact assessment

Detailed site investigation

Ecology environmental study report

Geology report

Closure Socio-economic Impact Assessment Report
