

# Arctic development

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**RAMBOLL**

Bright ideas.  
Sustainable change.



# The leading consultancy in the Arctic

The Arctic communities are strongly focused on creating economic opportunities for the local populations while respecting the local environment and minimising climate impact. By leveraging expertise in Arctic engineering and consultancy, Ramboll assists clients in sustainable development across various sectors such as society development, infrastructure, buildings, energy, water, waste management, and mining.

## Buildings

As one of Europe's top buildings designers with decades of experience in the global market, we create inspirational, sustainable and award-winning buildings that allow people and nature to flourish.

We design more than 10 million square meters of buildings every year and are a preferred partner of the world's leading architects and developers. Technology and design is our passion, and we have an unwavering focus on excellence in everything we do. We hold the industry's top certifications within sustainable design and are leaders in Building Information Modeling.

## Transport

Mobility fuels economic and social development and with 50% of the world's population now living in urban areas, efficient and reliable transport systems are essential.

To meet this need, Ramboll works on some of the world's largest, most innovative infrastructure projects and is the leading consultancy in the Nordic and Arctic markets. We create value for transport authorities, contractors and local authorities by providing multidisciplinary technical excellence and minimising resource usage.

## Aviation

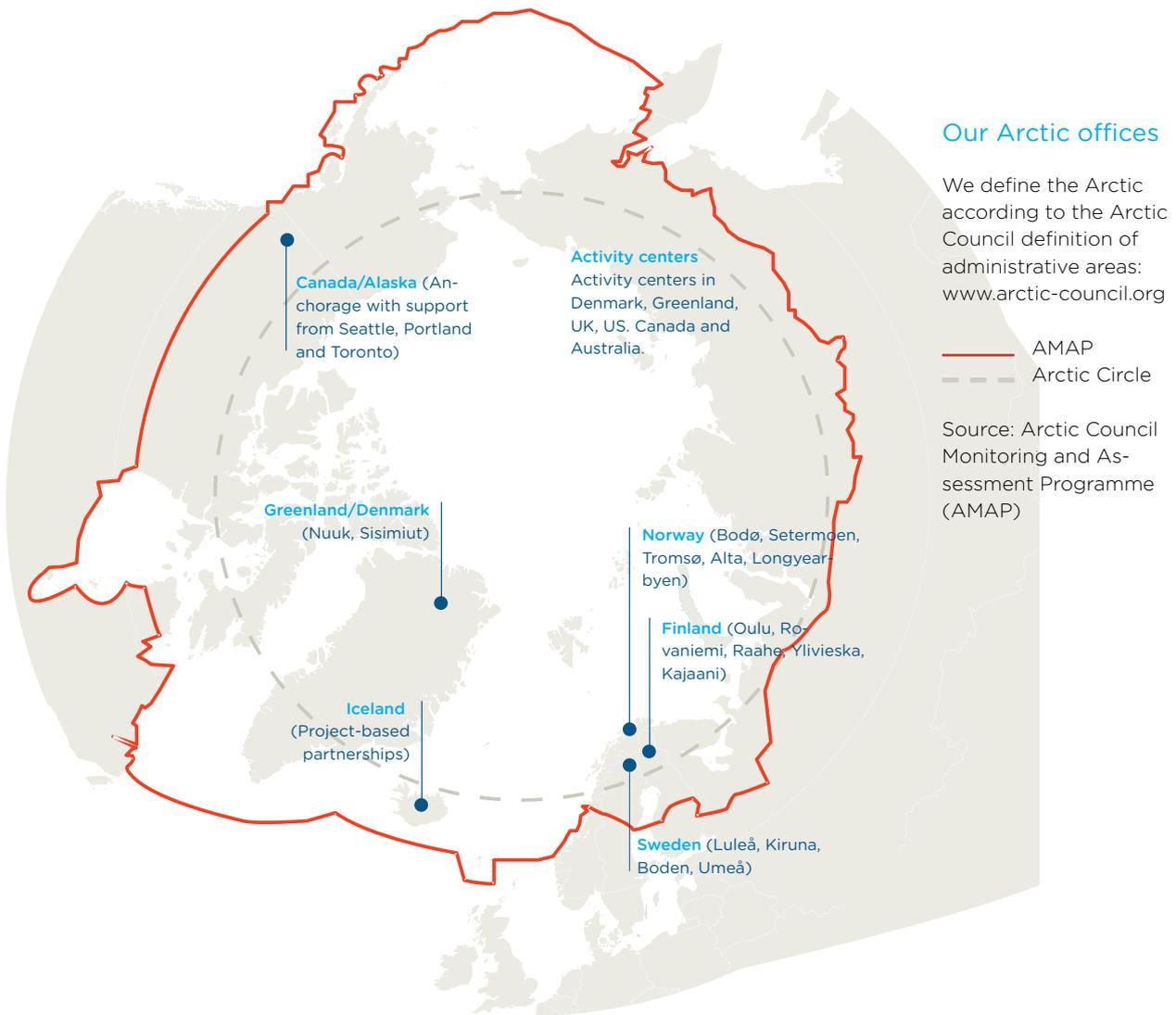
Aviation is one of Ramboll's key competences in general and in the vast Arctic and Antarctic regions. In many of these areas, flying is the only means of transport for the local population, as well as for tourism, scientific research and connecting to the rest of the world.

Ramboll has for many years provided unique design solutions for airside, runways, terminals and hangars in extremely demanding environments. Furthermore Ramboll has developed new route structures for fixed wing aircraft and helicopters.

## Water

Working with municipalities, utilities and industrial clients, Ramboll draws on proven multidisciplinary expertise to manage the most challenging water resources, wastewater, and stormwater issues.

We integrate treatment process selection and engineering, operational services, and regulatory management and planning to deliver innovative solutions that benefit both industry and society.



## Energy

Security of power supplies, climate change, energy efficiency and resource scarcity are top priorities for a sustainable society.

Ramboll is at the forefront of addressing these issues as the global market leader in offshore wind, wasteto-energy and district heating consulting and the leader in Scandinavia for large-scale thermal power consulting. We also have a specialist competence in designing power transmission masts and offshore wind met masts.

## Mining

Mining is evolving – becoming more efficient and responsible than ever before. As the industry plays an increasingly crucial role in securing regional and international self-sufficiency, it's more important than ever to lead this transformation.

We work closely with domestic and international mining clients to manage their most demanding environmental and social challenges throughout the project lifecycle. From exploration through permitting, construction, operation, closure, and postclosure, we provide practical and sustainable solutions to pressing issues in many of the world's most challenging settings.

## Ports & Marine

World ports and marines need to be commercially successful, create positive synergies amongst local stakeholders, and manage their impact on the environment responsibly.

Ramboll's ports and marine experts work at the forefront of the maritime sector on a broad range of projects in some of the world's most demanding environments. We are sensitive to the commercial pressure our clients face, and we create safe and innovative solutions that mitigate risk while meeting budget constraints.

## Environment & Health

As a globally recognised environmental and health consultancy, we have earned a reputation for technical and scientific excellence, innovation and client service. Advances in science and technology and evolving regulatory, legal and social pressures create increasingly complex challenges for our clients. We evolve to keep pace with these changes – by adding new services, contributing to scientific advances or expanding geographically.

# 30-year arctic expertise



With a 30-year proven track record operating in the Arctic, Ramboll is the region's leading consultancy with unparalleled knowledge of the area's sensitive natural environment, societal considerations, and special working conditions.

Our considerable capacity across the Arctic also places us in a strong position to deliver international projects.

Ramboll offers clients impartial advice and an integrated multidisciplinary service that brings together engineering, design, and

management consulting expertise. This enables us to provide qualified guidance and support at every stage of the value chain – from strategy development to the execution phase.

We have a comprehensive understanding of the challenges and opportunities facing communities across the Arctic region.

Our experts have extensive experience supporting the mining industries as well as a broad project portfolio of infrastructure projects from the Arctic.

- Ramboll permanent offices
- Ramboll project office
- Airport/airstrip projects
- Harbor projects

# How we work

## Local partner – global knowledge

### Specialists In The Arctic

Drawing on our longstanding presence in the Arctic, we build a bridge between projects, society, and regulators.

We appoint Arctic-based project managers who understand the local market and are specifically trained in effective project handling in an Arctic context. Our project managers are also adept at overseeing cross-border projects and drawing on

competencies from across the Ramboll Group to provide clients with the very best specialist expertise.

### Minimising Project Risks

Our “Front Loading” project management tool is particularly valuable in the Arctic since it enables us to assess political, environmental, process and technical risk at the very earliest stages of a project.



Image: Ture Andersen

### Case Story

#### Kiruna, Sweden

Parts of Kiruna are at risk of sinking into the iron ore mine that the town is built around. Work has therefore begun to move more than 30% of the town two miles to the East. Ramboll is preparing the new land for construction and ensuring that the old industrial land fulfills the Swedish Environmental Protection Agency's directions.

Kiruna Town Hall credit: Henning Larsen



# Ironbark's Citronen zinc-lead deposit

The Citronen Fjord zinc deposit is located in north-eastern Greenland, in the High Arctic region, with long, cold winters and continuous permafrost. The zinc-lead deposit will comprise both underground and open-pit mining operations. Ramboll was contracted to assist with updating of the Infrastructure, Construction and Logistics portion of the Feasibility Study.

Within this study, the airfield and aviation study covered the following:

- The role and importance of air transport for the mining project
- The regulatory framework for the airfield and air transport to and from the mine
- Analysis of the topographical landscape and Obstacle Limitation Surfaces (OLS)
- Review of the previously proposed airfield location in the

- preceding Feasibility Study
- Comparative analysis of alternative airfield locations and concepts
- Dimensioning aircraft types
- Potential routes and connections to and from Citronen Fjord
- Logistic analysis
- Red flags for the construction of an airfield at Citronen Fjord

## Client

Ironbark Zinc Ltd.

## Location

Citronen Fjord, North-East Greenland

## Period

2020-2021

## Services provided

Feasibility Study, Mining Logistics, Shipping Logistics, CAPEX, OPEX, Construction Schedule, Ports & Marine Structures, Airport, Roads, Utilities, CAPEX, OPEX, Construction Schedule.



# Assessment of the regional economic impacts of the Sokli Mine

A comprehensive assessment of the regional economic impacts of the Sokli mining project was needed to support its planning at various regional levels. The aim was to provide information on the direct and indirect effects of mining throughout the mine's entire lifecycle on Savukoski, Lapland, and the rest of Finland. This information was intended to support regional development, decision-making, and stakeholder communication.

The study assessed the direct and indirect impacts of different phases of mining on employment, investments, tax revenues, and the regional economy. The assessment was based on inputoutput analysis and regional economic modeling methods. The review covered not only the construction and operational phases, but also the

economic impacts of the research and development phase as well as the closure phase. The analysis also considered the mine's impact on the region's business and service structure.

The study provided a comprehensive view of the mine's effects on the local and national economy throughout its lifecycle. The results help to understand the regional economic significance of different phases and support decision-making at both municipal and regional levels. The assessment also serves as valuable background information for land use planning, permitting processes, and communication with various stakeholders.

## Client

Finnish Minerals Group

## Location

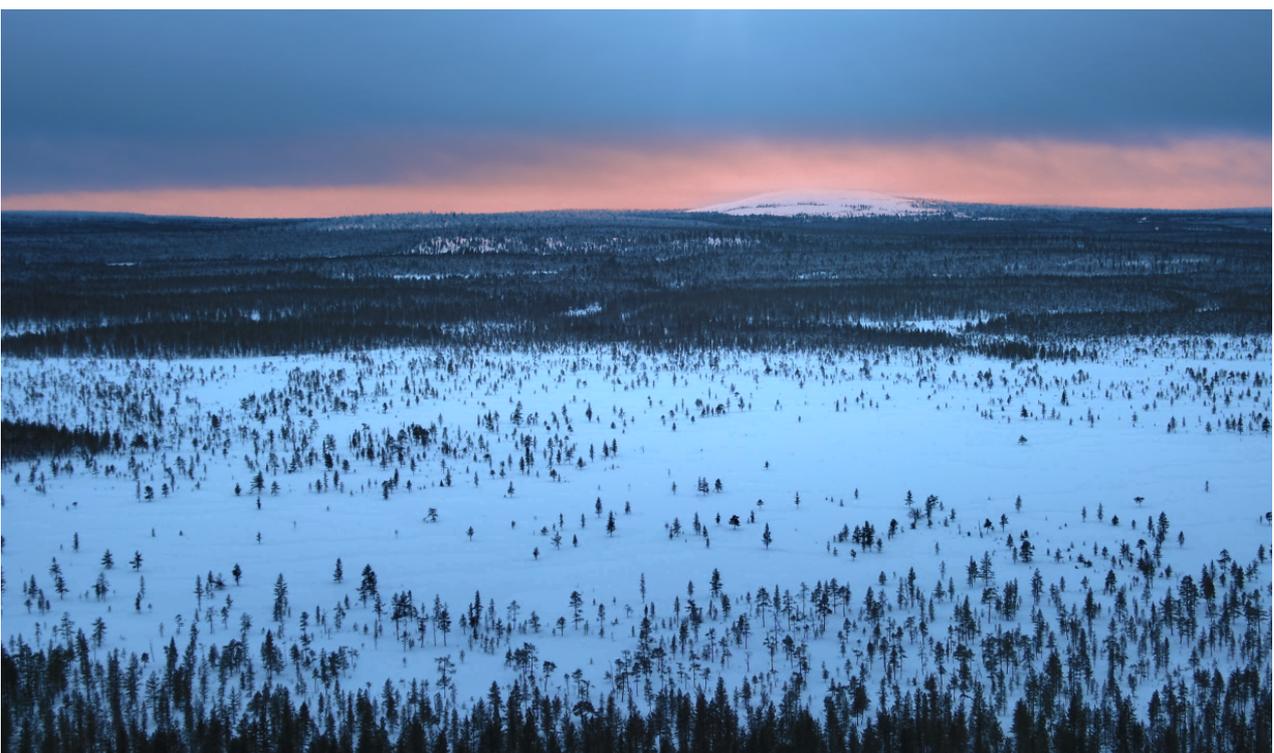
Sokli, Finland

## Period

2024-2025

## Services provided

Impact Assessments, Economic Analyses and Modelling, Planning and Urban Design, Stakeholder Engagement and Communication, Business Development and Strategy



# EIA for the expansion of the Siilinjärvi Mine

Ramboll has conducted an Environmental Impact Assessment (EIA) for the potential expansion of the Siilinjärvi mine, led by Yara's Tule Project. Yara plans to extend mining operations in Siilinjärvi beyond the current permit limit of 2035, aiming to continue until the 2060s. This expansion requires new ore reserves and increased capacity for waste rock and tailings disposal.

From November 2021 to August 2022, Ramboll developed the EIA program and compiled the assessment report from October 2022 to August 2024.

The assessment covered four implementation options and the zero option (no project). The EIA aimed to provide crucial information for decision-making, permitting, regional cooperation, and public awareness. Ramboll utilized its Digi-EIA service

to present the results broadly to the public.

The EIA included modeling, nature studies, stakeholder surveys, meetings with authorities, and local community engagements. The findings were shared at public events and with authorities, the monitoring group, and the Siilinjärvi municipal council. Over 40 Ramboll experts were involved.

The impact assessments will inform future planning and permits essential for the expansion project. Following the reasoned conclusion on November 28, 2024, Yara will begin detailed planning, with permits expected from 2025 to 2028. Extending mining operations preserves jobs, sustains tax revenue, and maintains Siilinjärvi's attractiveness as a major employment hub. It also supports national security of supply, given Siilinjärvi mine is the EU's sole phosphate mine.

## Client

Yara

## Location

Siilinjärvi, Finland

## Period

2021-2024

## Services provided

Environmental Impact Assessments (EIA), Architecture and Urban Design, Engineering, Sustainability and Climate Services, Project Management



# Hannukainen mine, Consulting services

Since 2015, Ramboll has been deeply involved in providing consulting services for the Hannukainen Mine located in Kolari, Lapland. The mine, which was previously operational between 1989-1990, is situated in an environmentally sensitive area at the confluence of three trout rivers. The client aims to reopen the mine to produce high-quality iron ore concentrate and copper-gold concentrate, with particular attention to managing the environmental impact due to the presence of sulphide-bearing rocks that pose a risk of acid mine drainage.

Ramboll's responsibilities encompass a comprehensive assessment of the environmental impact, development of waste rock and tailings disposal methods, and the design of protection measures to mitigate acid mine drainage. Our team has also

devised a detailed mine closure plan, which includes passive treatment methods for pit lake water discharge. Furthermore, recent efforts involve CAPEX and OPEX calculations to support the client's application for Critical Raw Materials Assessment (CRMA) status.

Our work supports the development and operational excellence at the mine site, ensuring high standards are maintained for environmental sustainability and resource management. Continuously collaborating with the client, Ramboll aims to facilitate the mine's reopening and sustained development, contributing to the project's success and environmental stewardship.

## Client

Hannukainen Mining Oy,

## Location

Lapland, Finland

## Period

2015-ongoing

## Services provided

Environmental impact assessment, waste rock and tailings disposal methods, protection measures against acid mine drainage, mine closure plan, passive treatment of pit lake water discharge, CAPEX/OPEX calculations.



# Kokkola smelter, Process Waste Facility

The Boliden Kokkola Smelter site houses a substantial Process Waste Facility (PWF), surrounded by dam structures classified as Class 1 dams. As an ICMM member, Boliden pledges to uphold the Global Industry Standard on Tailings Management (GISTM) for its operations.

Ramboll serves as the Designer of Record for the Boliden Kokkola project. We are responsible for ensuring the geotechnical validation and design of the facility and its dams in strict adherence to the GISTM standard. Our comprehensive services encompass extensive fieldwork investigations, geotechnical stability calculations, benchmarking of the facility, risk assessments, water balance studies, and the preparation of Site Characterization and Design Base Reports for the

PWF, basins, and dams. Additionally, we provide various geotechnical and civil engineering tasks and operational support to the PWF Responsible Waste Facility Engineer.

Ramboll supports the permitting process and designs for expansion areas, including the development of impermeable bottom structures and capping structures. As of 2025, Ramboll's involvement continues to enhance dam safety and operational efficiency at the Boliden Kokkola facility. The overarching objective of the project is to ensure GISTM conformity and to advance the facility's development and operational standards to the highest level.

## Client

Boliden

## Location

Kokkola, Finland

## Period

2024-ongoing

## Services provided

Extensive fieldwork investigations, geotechnical stability calculations, benchmarking of the facility, risk assessments, water balance studies, preparation of Site Characterization and Design Base Reports.



# Luikonlahti mine, Designer of Record

The inactive Luikonlahti mine site comprises a large tailings facility, concentrate storage areas, and clarification ponds. Boliden, as a member of the International Council on Mining & Metals (ICMM), is committed to adherence to the Global Industry Standard on Tailings Management (GISTM) and seeks to ensure the safe closure of the site in line with these standards.

Boliden chose Ramboll as the Designer of Record tasked with geotechnical validation and design in accordance with the GISTM standard. Ramboll's responsibilities entail comprehensive fieldwork investigations, geotechnical stability calculations, benchmarking of the facility, and risk assessments. Additionally, Ramboll prepares Site Characterization and Design Base Reports for the tailings storage

facility (TSF), clarification ponds, and dams.

As of 2025, Ramboll's work at the Luikonlahti mine site is progressing. The outcomes of Ramboll's efforts aim to enhance dam safety and promote operational excellence at the facility. The primary objective of the project is to achieve compliance with the GISTM standards. Beyond that, Ramboll strives to ensure Safe Closure of the tailings facility and clarification ponds upon completion of the closure activities.

## Client

Boliden

## Location

Kaavi, Finland

## Period

2024-ongoing

## Services provided

Fieldwork investigations, geotechnical stability calculations, benchmarking of the facility, risk assessments, preparation of site characterization reports, preparation of design base reports.



# Container terminal in Nuuk, Design & Build

The design and construction of a state-of-the-art container terminal on previously undeveloped land east of Nuuk, Greenland. This new terminal spans a substantial 60,000 m<sup>2</sup> area and includes space for 600 TEU (Twenty-foot unit) containers and 100 FEU (Forty-foot unit) refrigerated containers.

The main quay extends 310 m with a depth of 13 m, while the secondary quay is 50 m long with an 8 m depth. Both quay walls are designed as robust steel sheet piles with dual anchor levels and finished with concrete hammers. The terminal is outfitted with all necessary equipment for efficient container handling, including fenders, bollards, light masts, and rescue posts, and is future-proofed to support STS (Ship-to-shore) cranes.

Significant efforts have gone into preparing the terrain, with the seabed and rocky landscapes meticulously filled with 260,000 m<sup>3</sup> of crushed rock materials from controlled blasting processes. This thoughtful engineering ensures stability and operational efficiency.

Ramboll, as the technical advisor and designer, has provided comprehensive services including blasting, dredging, backfilling, sheet pile wall design, concrete structures for quay equipment, erosion protection, road and square planning, utility installations, and detailed 3D modeling.

Our pioneering design and construction work meets the demands of modern container terminal operations, setting new standards for Greenland's maritime infrastructure.

## Client

Per Aarsleff A/S

## Location

Nuuk, Greenland

## Period

2014-2016

## Services provided

Land and underwater blasting, sheet pile wall and anchor design, concrete anchor beam construction, erosion protection implementation, utilities planning and coordination, 3D terminal model development



# Road from Kangerlussuaq to Sisimiut

Ramboll served as the engineering consultant for the Environmental Impact Assessment (EIA) of the ATV (All-Terrain Vehicle) track project from Kangerlussuaq to Sisimiut, Greenland. This innovative infrastructure development aims to connect the Atlantic airport in Kangerlussuaq with Greenland's second-largest city, providing substantial benefits for both transportation and tourism.

Stage 1 of the project involved the construction of a 126 km long track and road system, which is a crucial starting point in the overarching plan. Stage 2, planned for completion between 2013 and 2023, includes a 16 km road and ATV track from Sisimiut to Kangerluarsuk Tulleq. This segment connects with Stage 1 from Kangerlussuaq, thus completing the route.

The construction encompasses a 650-metre long road that is 6 metres wide, equipped with protective ditches, oil-tight membranes, and a flow barrier to safeguard the environment, particularly around Drikkevands lake and the water barrier zone. The remaining section consists of a 3-meter wide ATV track.

Ramboll's role emphasizes significant environmental considerations, with rigorous EIA studies approved in stages in 2020 and 2022 to ensure minimal ecological impact

## Client

Qeqqata Municipality

## Location

Sisimiut, Greenland

## Period

2013-2023

## Services provided

Feasibility Studies and Route Reports, Design, Environmental Impact, Assessment (EIA) Reports, Tender, Project, Contracting, Construction Management



# District supply infrastructure for Qinngorput

The project “4A8 and C3, Ningitsivik” is located in the Qinngorput district in eastern Nuuk, Greenland. It spans approximately 15,000 square meters and is developed as a mixed residential area that encompasses detached single-family houses, semi-detached houses, and low-rise housing developments. The project includes 42 building sites designed to accommodate 270 homes.

The construction involved significant blasting and excavation to establish roads, paths, parking areas, utility buildings, and supply lines. The infrastructure work was extensive and included the installation of sewerage, water supply, district heating systems, high-voltage electricity supply, two transformer stations, individual site electricity supplies, and road lighting systems.

Ramboll provided a comprehensive range of services for this project, including design, construction management, supervision, sustainability management, planning of supplies for water, sewerage, district heating, electricity, and telecommunications cables, and authority processing. The district heating system installation comprised cables, trenches, expansion considerations, venting, and barriers. The drainage system was designed to connect individual plots through gravity lines to a pumping station, which then linked to the public drainage network via a 200-meter pressure line.

The project stands as a significant enhancement to the urban landscape of Nuuk, providing essential residential facilities and promoting sustainable infrastructure.

## Client

Nuuk City Development  
(Kommuneqarfik Sermersooq)

## Location

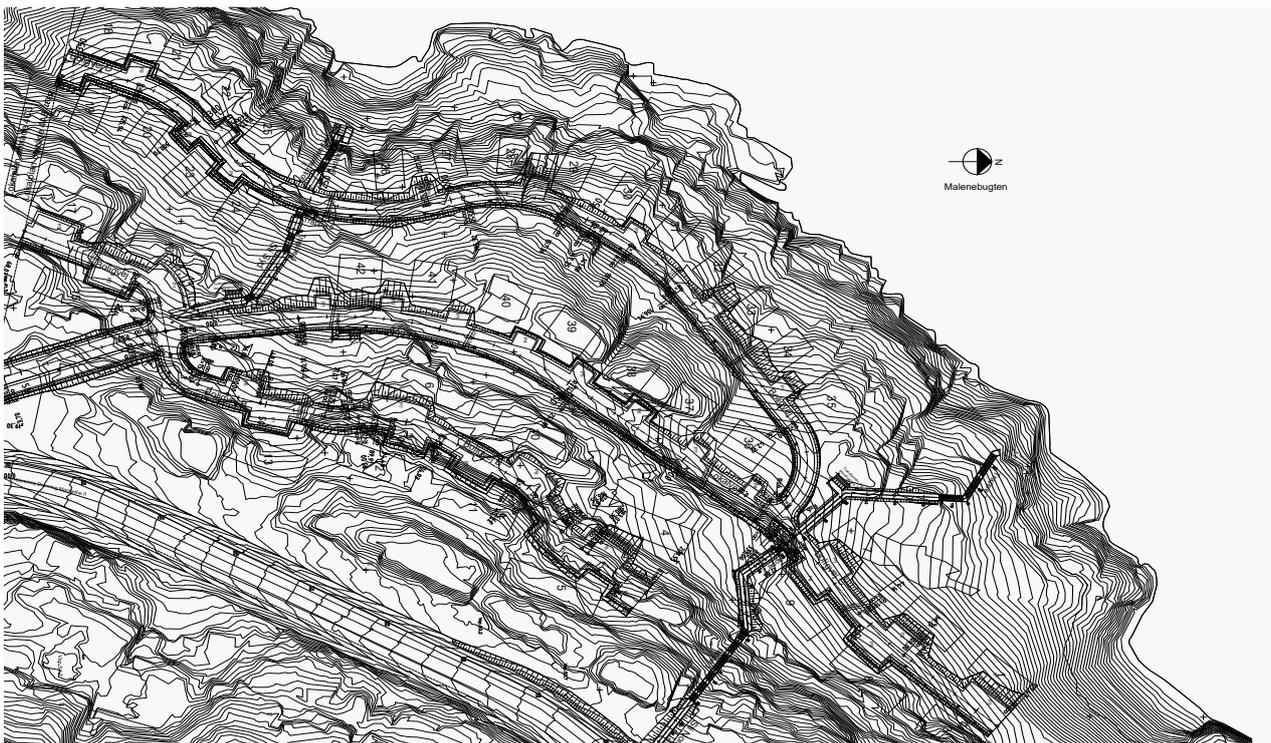
Nuuk, Greenland

## Period

2020

## Services provided

Design, construction management, supervision, planning of supplies for water, sewerage, district heating, electricity, and telecommunications cables, authority processing, sustainability management



# Kvanefjeld port Feasibility study

The port facility is part of an integrated Concentrator and Refinery complex in Kvanefjeld, Greenland, which supports the Kvanefjeld Rare Earth and Uranium Project. Ramboll has been commissioned to cover the port and logistics aspects of this extensive project. Our main deliverable, the Port Feasibility Study, demonstrates the technical feasibility of the future Kvanefjeld Port, ensuring it meets the necessary operational requirements.

Initially, Ramboll conducted a comprehensive Port Location Study. This study included evaluations of capacity and functional planning while identifying vital localization parameters such as coastal hydraulic conditions, maneuvering and navigation conditions, land use constraints, geotechnical conditions, archaeological constraints, waste management, environmental

impacts, and social considerations. Through this analysis, three potential port locations around Ilua Bay were identified. Ramboll provided comparative cost estimates and a SWOT analysis to determine the optimal site.

Following the initial screening, a single location was selected for detailed assessment in our Port Feasibility Study. This study involved developing a Conceptual Design Basis, creating a Conceptual Design, and estimating both capital (CAPEX) and operational (OPEX) expenses. Furthermore, a SWOT analysis and an implementation schedule were created for the chosen port location.

Ramboll's approach ensures the future Kvanefjeld Port will be a technically feasible and strategically sound addition to the client's operations in Greenland.

## Client

Greenland Minerals and Energy Ltd.

## Location

Narsaq, Greenland

## Period

2014-2015

## Services provided

Environmental Consulting, Engineering Design and Analysis, Architecture and Urban Planning, Project Management, Sustainability Services, Logistics and Transportation Planning



# Sikuki trawler terminal

## Climate impacts

Ramboll is actively involved in the development of the Sikuki trawler terminal in Nuuk. This aims to enhance the efficiency of shrimp transshipment for export markets. The project began with a sustainability workshop, consolidated into an action plan specifying responsibilities and project phases. CO2 reduction is incorporated into the project design, with concrete paving stones used to support heavy loads and steel anchors filled with blasting stones for structural stability.

Ramboll has also prepared tender descriptions and drawings for various installations including electrical setups, waterproofing, ISPS protection, lighting, and stone throwing for erosion protection. The contractor is required to present monthly CO2 accounts, which are compared with an established baseline, and penalties are imposed

for exceeding CO2 limits. Ramboll provides comprehensive client advisory services, covering sketch design, tender preparation, contract drafting, and active supervision throughout the construction phase.

This holistic approach ensures sustainability is maintained from the initial planning stages through to completion, exemplifying Ramboll's commitment to environmentally responsible engineering and consultancy services. The integration of sustainability measures not only aims to reduce climate impact but also incorporates the local labor force, promoting a sustainable economy and operational maintenance anchored to local conditions. Through systematic evaluation and stringent supervision, Ramboll ensures that the project remains aligned with its sustainability goals throughout its lifecycle.

### Client

Sikuki Nuuk Harbor A/S

### Location

Nuuk, Greenland

### Period

2024-2026

### Services provided

Sustainability workshop, preparation of action plans, tender descriptions, drawing up contract and competition conditions, client supervision during construction, evaluation of tender offers.



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