Nordic Mining

Engebø Rutile and Garnet

Definitive Feasibility Study – Executive Summary

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1. Abbreviations

The following abbreviations have been used in this report:

Table 1-1: Abbreviations

Abbreviation	Unit or Term
3D	three-dimensional
AACE(I)	American Association of Cost Engineers (International)”
amsl	above mean sea level
°C	degrees Centigrade
Ca	calcium
CAGR	Compound Annual Growth rate
CAPEX	Capital Expenditure
cm	centimetre
CP	Competent Person
CPM	Critical Path (Scheduling) method
DFS	Definitive Feasibility Study
°	degree (degrees)
EBITDA	Earnings Before Interest, Tax, Depreciation and Amortisation
EEA	European Economic Area
EIA	Environmental Impact Assessment
ESG	Environmental and Social Governance
ESIA	Environmental and Social Impact Assessment
ESMS	Environmental and Social Management System
FEED	Front-End Engineering and Design
FCF	Free Cash Flow
FEL	Front End Loader
FOB	Free on Board
g	Gram
g/cm^3	grams per cubic centimetre
GSI	Geological Strength Index
g/t	gram per tonne
ha	hectare
HCl	hydrochloric acid
HOA	Heads of Agreement
ICP-MS	Inductively coupled plasma mass spectrometry
IFC	International Finance Corporation

Abbreviation	Unit or Term
IFRS	International Financial Reporting Standards
IRR	Internal Rate of Return
JORC	(Australasian) Joint Ore Reserves Committee
kg	kilograms
kg/m^3	kilogram per cubic metre
km	kilometre
km^2	square kilometre
kV	kiloVolt
kW	kiloWatt
LOM	Life of Mine
LPG	Liquid Petroleum Gas
m	metre
m/s	metre per second
m^2	square metre
m^3	cubic metre
m^3/s	cubic metre per second
masl	metre above sea level
mm	millimetre
Mn	Manganese
Mt	Million tonnes
Mtpa	Million tonnes per annum
MW	Million Watts
NGU	Geological Survey of Norway
NOK	Norwegian Krone
NPV	Net Present Value
NSR	Net Smelter Return
NTNU	Norwegian University of Science and Technology
OPEX	Operating Expenditure
%	percent
P&ID	Piping and Instrumentation Diagram
PEP	project execution plan
PFD	Process Flow Diagram
PFS	Prefeasibility Study
PSD	particle size distribution
QA/QC	Quality Assurance/Quality Control

Abbreviation	Unit or Term
QEMSCAN	Quantitative Evaluation of Materials by Scanning
QRA	Quantitative Risk Assessment
QXRD	Quantitative X-ray Diffraction
RED	Rare Earth Drum
RER	Rare Earth Roll
REACH	Regulations for use of chemicals
ROM	Run of Mine
s	second
SEP	Stakeholder Engagement Plan
SG	Specific Gravity
SPMT	Self-Propelled Mobile Transporter
STD	Submarine Tailings Deposit
t	tonne (metric tonne) (2,204.6 pounds)
TiO_2	titanium dioxide
tpa	tonnes per annum
tph	tonnes per hour
tpd	tonnes per day
t/m^3	tonnes per cubic metre
µm	micron or microns
USD	U.S. Dollar
V	Volts
W	Watt
WACC	Weighted Average Cost of Capital
WBS	Work Breakdown Structure
WFD	Water Framework Directive (WFD)
WHIMS	Wet High Intensity Magnetic Separator
XRF	X-ray Fluorescence
y	year

2. Executive Summary

2.1 Introduction

This Executive Summary has been prepared by Hatch Africa (Proprietary) Limited (Hatch) on behalf of Nordic Mining ASA. The Project comprises the establishment of a mining and processing operation at the Engebø deposit. The Engebø deposit is one of the world's highest-grade rutile deposits and is unique due to its substantial content of garnet. The mineral rights to the Engebø deposit are held by Nordic Mining's wholly owned subsidiary Nordic Rutile AS. Nordic Mining is a public company listed on Norway's Oslo Stock Exchange Axess list (OAX: NOM).

Two minerals, rutile and garnet, will be produced from Engebø, which is a hard rock deposit containing high grades of both rutile and garnet. Rutile is a titanium feedstock, primarily used in the production of titanium pigment, titanium metal and welding rods. The Engebø garnet, which is almandine, is used commercially in the abrasives and waterjet cutting industries.

The deposit is situated in a sparsely populated region of western Norway next to an existing deep-water ice-free quay.The quay is located by the Førde Fjord adjacent to the North Sea, providing easy-access for shipping to Europe, North America and other destinations.The coastal climate with mild winters and summers enables mining and processing operations to continue uninterrupted throughout the year.

The Project represents a long term industrial operation with significant positive impact at local, regional and national levels, securing export revenues for a period of more than 40 years. The Project will be a cornerstone business in the local community offering long term employment in a variety of qualifications. The Project will be developed according to high international standards for Environmental and Social Governance (ESG).

The dual-mineral concept with production of Rutile and Garnet provides a profitable business case with robust economics. The individual products can buffer the Project's economics pursuant to market variations. The characteristics of the deposit allows for a quick ramp-up of open pit mining of high grade ore with a low stripping ratio. The processing facility utilizes industry standard physical separation technologies to separate the two minerals.

Nordic Mining has already secured key permits and established relations with offtake partners for both Rutile and Garnet.

2.2 Project Highlights

2.2.1 Economic Analysis

The basis for the Project is the geological properties of the Engebø deposit including the Mineral Resource Statement, the Ore Reserve Statement and the mine plan and process flowsheet with estimates for capital expenditures and operating costs. These fundamentals are further described in this Executive Summary.

The commercial scenario developed for the Project is based on two product revenue streams from a 1.5 million tonnes per annum (Mtpa) Run of Mine (ROM) mining and processing operation, with open pit mining starting in 2022 and continuing for 15 years.

Production from the underground mine will start in year 13 to enable underground production to replace production from the open pit.

At the end of the underground mining phase, the ROM feed to the plant will progressively be replaced from the accumulated stockpile of medium and low grade ore from the open pit phase, extending the total lifetime of the project to over 40 years. The mining plan and mineral processing for the Project is based on the Measured and Indicated categories from the Mineral Resource Estimates. Significant mineral resources (Inferred Resources) may be qualified through future drilling programs to extend the Project lifetime. The DFS has been done according to JORC reporting standards.

The economics of the Project were evaluated with an Excel-based real-basis financial model developed in 2019 US dollars (USD) to present the cost structure and the economic valuation of the Project as a stand-alone entity. The rutile and garnet prices were based on long term outlook estimates from TZMI. The FOB-price for rutile was stated at USD 1,142 per tonne (2019 dollars) for a 95% TiO_2 rutile concentrate. The average FOB-price for a 92% garnet concentrate was stated at USD 248 per tonne (2019 dollars).

An exchange rate of 8.9 NOK/USD was used in the financial calculations. The Project cashflows were modelled to year 2065. The financial model is used for estimating future cashflows and evaluate the Project's net present value (NPV), internal rate of return (IRR) as well as simple and discounted payback periods. In general, a conservative approach were taken in the evaluation of the Project.

The initial capital expenditure (CAPEX) for the Project was estimated at USD 311 million. This includes the open pit mining operation and the processing plant facilities. A deferred capital expenditure of USD 25 million related to the underground mining operation will likely be financed from operating cashflows.

The pre-tax values obtained for the Project comprise NPV (USD 450 million at 8% discount rate), IRR (21.88%) and a payback period of less than five years from start of operation.

The post-tax values obtained for the Project comprise NPV (USD 344 million at 8% discount rate), IRR (19.83%) and a payback period of less than five years from start of operation.

The net operating undiscounted cashflow from the Project over the 42 year Project lifetime is around USD 2.2 billion.

Table 2-1 shows the key production and financial figures for the Project.

Figure 2-1 shows the post-tax free cashflow for the various cash components. It is overlaid with the net cashflow and cumulative cashflow.

Table 2-1: Key Production and Financial Summary

Project Financials	Unit	Value
Pre-tax NPV @ 8.0%	USD million	450
Pre-tax IRR	%	21.88
Net Project Operating Cashflow (undiscounted)	USD million	2,160
Post-tax NPV @ 8%	USD million	344
Post-tax IRR	%	19.83
Payback Period	years	4.17
Production Capacity		
Initial Production Capacity ROM	Mtpa	1.5
Capital Expenditure		
Initial Capital Expenditure for Open Pit and Processing Plant	USD million	311
Deferred Capital Expenditure for Underground Mine	USD million	25
Operating parameters first full 15 years of commercial production		
Average Operating Cost[1,2]	USD/ROM tonne	15.44
Average Operating Cost[1,2]	USD/Sales tonne	73.36
Average Operating Revenue[1,2,3]	USD/Sales tonne	339.47
Mining and Processing[4]		
Open Pit Phase	years	15
Total Open Pit Ore Production	Mt	22.9
Underground Phase	years	19
Total Underground Ore Production	Mt	28.8
Stockpile Phase	years	8
Total Stockpile Ore Production	Mt	11.3
Total Project Lifetime	years	42
Total Project Ore Production	Mt	63.1
Average Ore Grade – Rutile[1]	%	3.85
Average Rutile Recovery[1]	%	56.54
Average Ore Yield – Garnet[1]	%	18.82
Product Price Assumptions (2019 dollars)		
Rutile Price	USD/Sales tonne	1,142
Average Garnet Price	USD/Sales tonne	248

[1] Average first 15 years
[2] Rutile and Garnet combined
[3] Net of royalties
[4] 3 m dilution applied on ore boundaries in the resource model

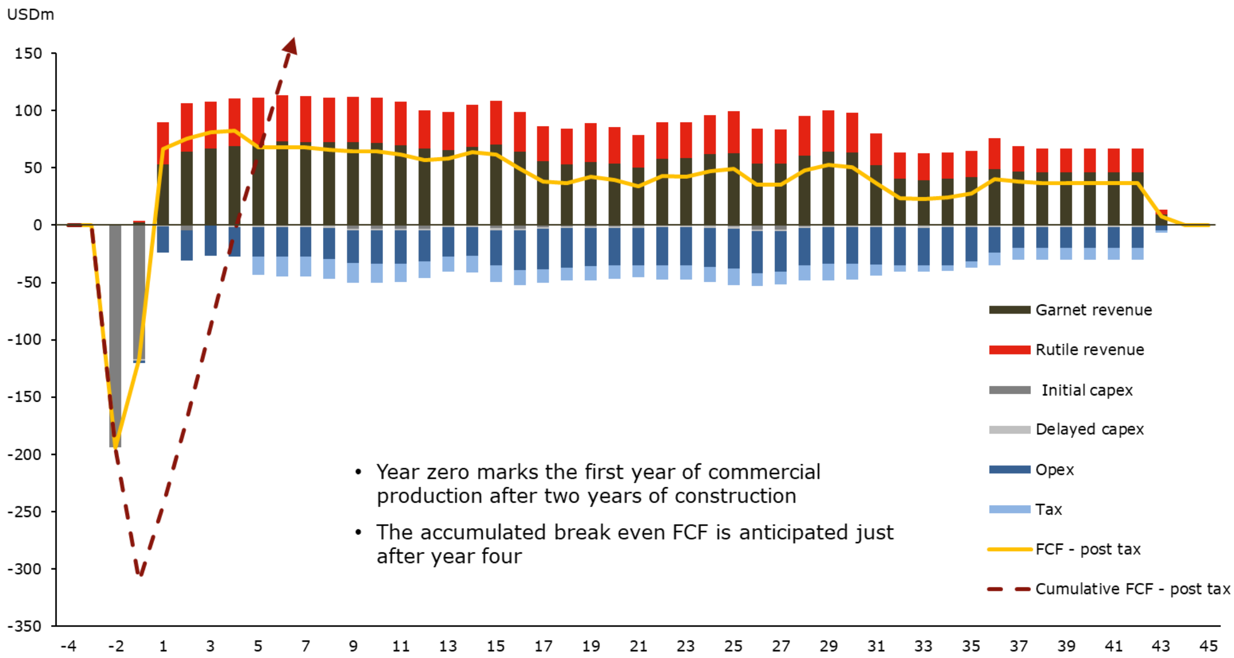

Figure 2-1: Cashflow Components Overview

Figure 2-2: below illustrates that the NPV is positively correlated to rutile revenue and garnet revenue, and negatively correlated to capital costs (CAPEX) and operating costs (OPEX). Changes in Garnet revenue has a larger impact than changes in Rutile revenue. Changes in CAPEX has a slightly larger influence on NPV than OPEX. NPV sensitivities are linear to the various expanded components.

Figure 2-3: below illustrates that the IRR is positively correlated to Rutile revenue and Garnet revenue, and negatively correlated to CAPEX and OPEX. Changes in Garnet revenue has a larger impact than changes in Rutile revenue. Changes in CAPEX has a larger influence on IRR than OPEX.

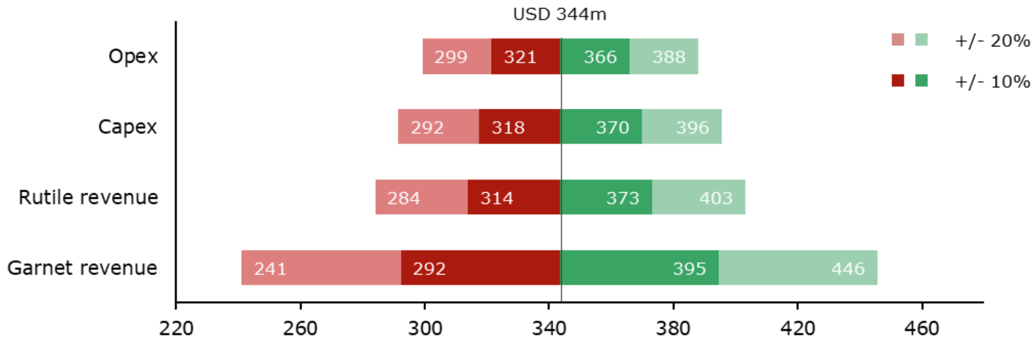

Figure 2-2: NPV Sensitivity (post-tax)

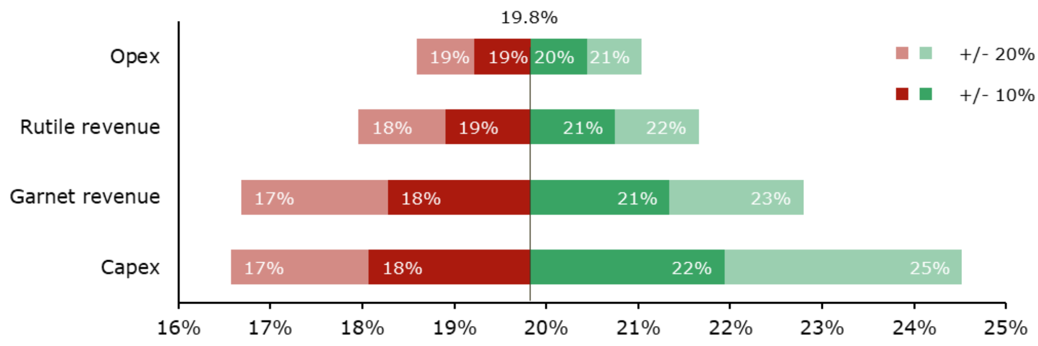

Figure 2-3: IRR Sensitivity (post-tax)

2.2.2 Key Project Characteristics

- **Low Cost Mining Operation:** The Engebø deposit is a large, outcropping high-grade resource. This allows for easy transition from open pit mining to efficient underground bulk mining. The profile of the deposit enables the use of a ore pass for open pit mining, reducing the ore transportation distance and costs to a minimum. The average open pit stripping ratio (waste tonne/ore tonne) is 0.55, with limited overburden. The geotechnical setting favours low operating costs due to low support requirements which allows for progressive mining both in the open pit and the underground operations. Hydrogeological conditions for the open pit and underground mine offer low risk of water inflows and low hydraulic conductivity through competent ore and country rocks.

- **Long Project Lifetime:** The 42 year Project life will position the operation as a corner-stone enterprise in a local and regional context. Substantial inferred resource has been documented and may allow for extension of the mine life.

- **High-Quality Products:** A comprehensive program of comminution and process testwork has shown that standard technologies can be applied to maximize recoveries of rutile and garnet. The DFS program has been successful in producing a commercial rutile product suitable for pigment and metal production. Through extensive testing of various garnet products, a strategy to produce an high performance 80 mesh garnet product has been selected to achieve maximum resource utilization.
- **Environmental and Social Governance (ESG):** The Project will be developed with high environmental and social standards in accordance with IFC Guidelines and relevant Equator Principles. Compact Project infrastructure, minimal internal transportation and accessible sea freight, allows for a low carbon footprint and limited land use. The main source of energy will be renewable hydroelectric power. The Engebø ore consists of inert minerals which enables an operation without acidic run-off, heavy metal contamination and radioactive pollution. The Project will be developed to positivly impact on people’s livelihood, education, work opportunities and cultural flourishment. Stakeholders’ engagement will be continued and strengthened ensuring that a dialogue with neighbors, communities and interest groups based on transparency, respect and responsiveness.
- **Favourable Infrastructure:** The Project is located near existing infrastructure with reliable power and process water sources available within a few kilometres from the site. Natural gas for product drying is available from regional suppliers. The existing deep-water quay caters for low cost sea based logistics during construction and operations.
- **High and Stable Cashflow:** Average operating cost per sales tonnes (Rutile and Garnet combined) in the first fifteen years of operation is USD 73, compared with average revenue per sales tonne of USD 339. Consequently, the project generates a high cashflow which enables a short payback period (<5 years).
- **High Revenue to Cost Ratio:** The Project benefits from high value products and low operating costs. The dual mineral operation with shared production cost offers a revenue to cash cost ratio for rutile of approximately 4.1, ranking the Project in the first quartile amongst global titanium feedstock producers. This is illustrated in Figure 2-4 below with estimations for 2023.

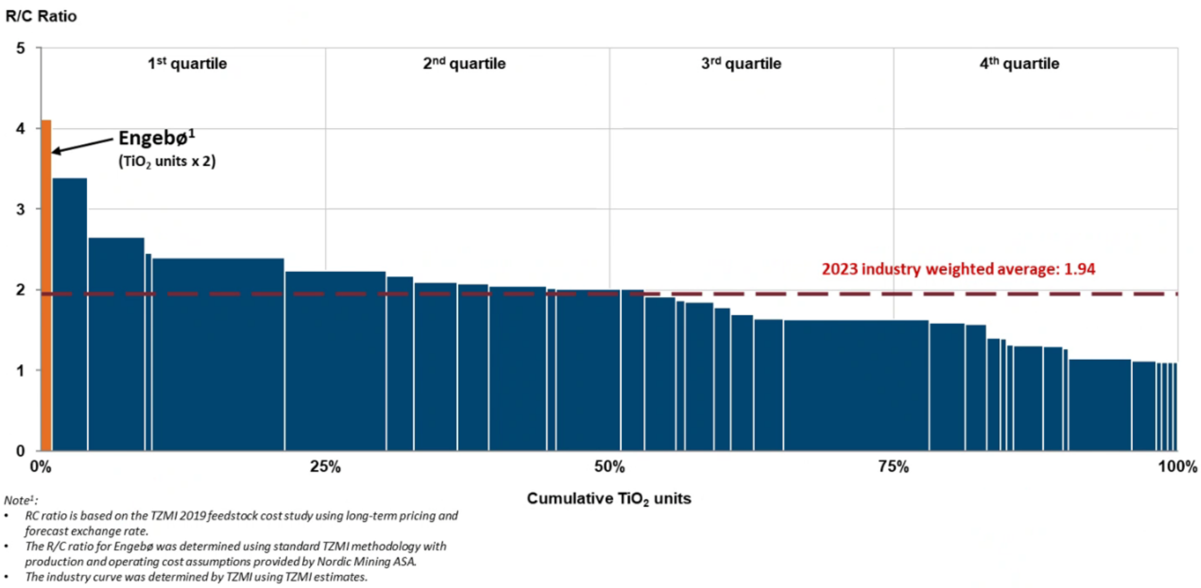

Figure 2-4: Revenue to Cost Ratio

2.2.3 *Future Upside Opportunities and Flexibility*

There are unquantified upside potentials related to:

- Sale of waste rock for aggregate products to infrastructure projects
- Additional sales of coarse and fine grained garnet products
- Additional sales of low grade rutile products
- Extending the Project lifetime through increased ore reserves from Inferred Resources.

2.2.4 *Effective Date and Declaration*

This report is considered effective as of 28 January 2020.

2.2.5 *Contributors*

The DFS has been prepared through collaboration between a number of recognized consulting firms. The key Project contributors are summarized in Table 2-2 below.

Table 2-2: Key Project Contributors

Company/Person	Primary Source of Services
Hatch Johannesburg, South Africa	• Main Technical Consultant • Mineral Comminution and Processing • Mining • Project Infrastructure and General Infrastructure • Engineering Design • Procurement • Capital and Operating cost estimate • Human Resources and Operation Readiness • Financial Analysis • DFS coordination, report write-up and quality assurance
Adam Wheeler Independent Mining Consultant, Cornwall, United Kingdom	• Competent Person for Mineral Resource and Ore Reserve Estimations in accordance with the guidelines of the JORC Code • Mineral Resource Statement • Mining • Ore Reserve Statement
IHC Robbins Brisbane, Australia	• Metallurgical testwork programs and results • Flowsheet development and advisory
Ligth Deep Earth Pretoria, South Africa	• Metallurgical testwork programs and results
Core Group Brisbane, Australia	• Flotation testwork
COWI Fredrikstad, Norway	• Tailings Disposal design and engineering
Asplan Viak Sandvika, Norway	• Regulatory works • Engineering of county road and fresh water supply
DNV GL, Bærum, Norway	• Environmental assessments • Environmental monitoring
SRK Cardiff, UK	• Geotechnical investigation • ESG Evaluation and Report
SINTEF, Trondheim, Norway	• Tailings management modelling
TAK Industrial Mineral Consultancy Gerrards Cross, United Kingdom	• Garnet market information
TZMI Perth, Australia	• Rutile market information • Garnet market Information

2.3 Project Description

2.3.1 *Location*

The location of the Engebø Project ("the Project") is in Naustdal in Sunnfjord municipality in Vestland county on the west coast of Norway. The Project site is on the northern side of the Førde Fjord with short and navigable access to the North Sea.

Sunnfjord municipality was established 1 January 2020 from a merger between the previous Naustdal municipality and three neighbouring municipalities, Førde, Gaular and Jølster. Sunnfjord municipality has approximately 22,000 inhabitants. Further, and also effective from 1 January 2020, the Vestland county was established in a merger between the previous Sogn og Fjordane county and Hordaland county. The population in the Vestland county is approximately 630,000 people.

The Project site location and the existing regional infrastructure in the Sunnfjord area is shown in more detail in the regional map in Figure 2-5 below.

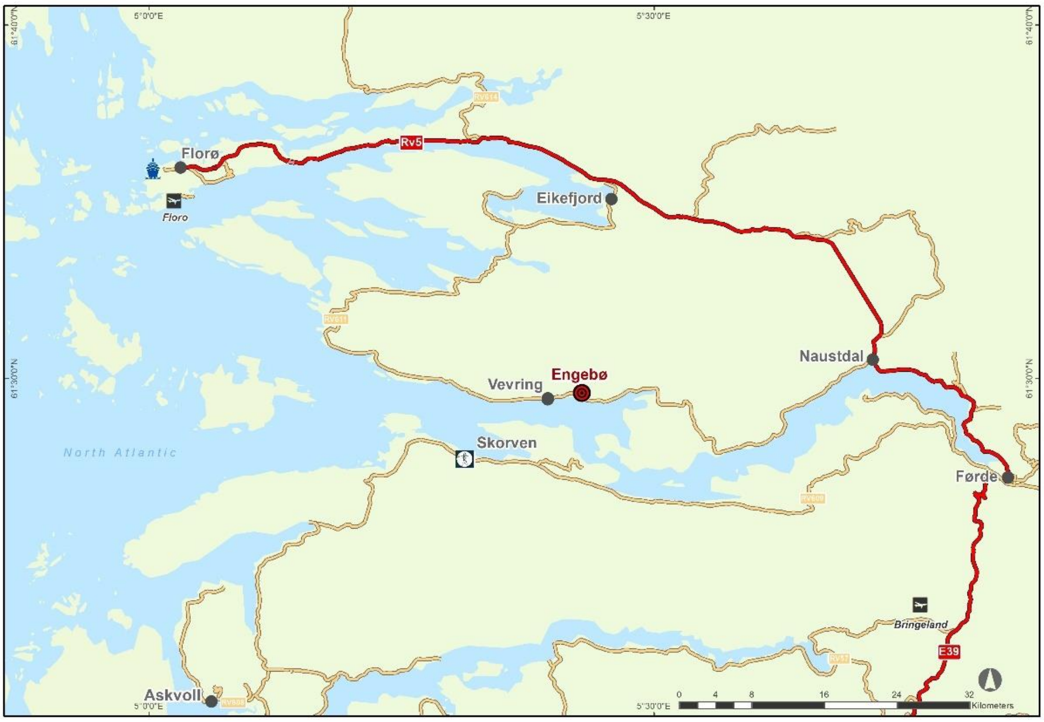

Figure 2-5: Engebø Project site and infrastructure in the Sunnfjord region

2.3.2 *Area of Property*

The property on which the Project is located consist of two areas:

- The processing plant area including an existing deep-water quay
- The mining, service and rock storage area.

Both areas are located within the regulated area of the approved zoning plan for mineral extraction and processing at Engebø. The zoning plan area including the areas for mining, mineral processing and deposition of tailings is shown in Figure 2-7.

Nordic Mining has signed agreements with three private landowners who own the area for the processing plant, giving Nordic Mining the right to acquire the subject properties. The option agreements are valid until 2025 with exclusive rights for Nordic Mining to extend the option period.

The open pit mining, service and rock storage areas are owned by the same three landowners who owns the processing plant area. Nordic Mining has entered into agreements with the three landowners which provides Nordic Mining an exclusive right to use the area for mining operations including required infrastructure and installations. The agreements regulate the compensation to the landowners for the extraction of rutile, garnet and possible other minerals.

2.4 Mineral Tenure, Permits and Licenses

Nordic Mining, through the wholly owned subsidiary Nordic Rutile, holds nine valid Extraction Permits covering the entire planned mining area, as shown in Figure 2-6 below.

Pursuant to the option agreement with the three main landowners, Nordic Mining, through Nordic Rutile AS, has access to the mining and processing plant areas both by land and sea.

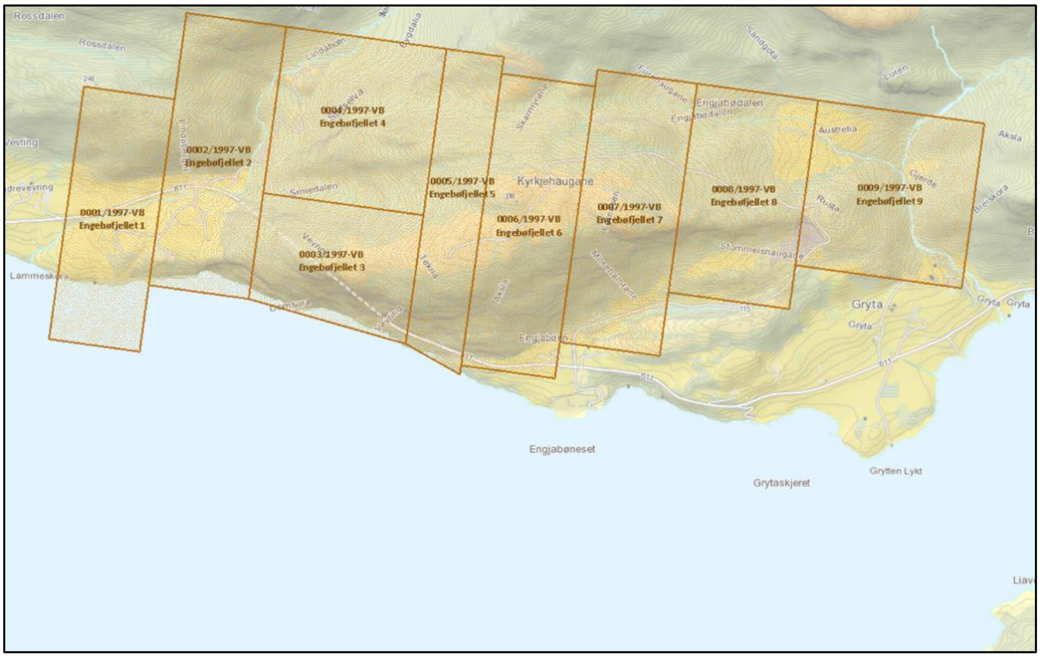

Figure 2-6: Extraction Permits held by Nordic Mining at Engebø

2.4.1 Key Permits – Overview and Status

There are three key legislative requirements for mining operations in Norway: zoning plan, environmental permit and operational license. A comprehensive Environmental and Social Impact Assessment (ESIA) is required in order to be granted zoning plan and environmental permit. After evaluating the risks, the Company gave priority to obtaining these permits, commencing the regulatory work in 2007. The zoning plan and environmental permit were fully granted in 2015 and 2016. The operational license is currently under review by the Directorate of Mining and is expected to be granted in the first quarter of 2020.

Table 2-3: Status for permits and approvals required for the Project

Permits and Approvals Required	Authority	Status	Comment
Project zoning plan	Naustdal and Askvoll Municipality	Approved, 2015	Final approval with no further possibility for appeal.
Detailed zoning plan	Naustdal Municipality	Approved, 2019	Some adjustments and optimisations to the original plan
Enviromental permit	Environment Agency	Approved, 2016	Final approval with no further possibility for appeal.
Updated discharge permit for chemicals	Environment Agency	Test program initiated as requested by the Environment Agency	Anticipated approval within 2020
Zoning plan for water pipeline pathway	Sunnfjord and Askvoll Municipality	Public hearing closed May 2019. Awaiting further notice.	Anticipated approval Q1 2020
Operational license	Directorate of Mining	Public hearing closed November 2019. Awaiting further notice.	Anticipated approval Q1 2020

2.4.2 Zoning Plan

The zoning plan is regulated by The Planning and Building Act (27 June 2008) governed by The Ministry of Local Government and Modernisation. An Environmental and Social Impact Assessment (ESIA) is mandatory for projects of a certain size, such as the Engebø Project. The zoning plan was finally approved 17 April 2015 by The Ministry of Local Government and Modernisation.

Figure 2-7 shows a map of the zoning plan for the Engebø Project. Approximately 2 km^2 of land is regulated on land. A 4.4 km^2 area of seabed is regulated for submarine disposal of tailings. Tailings from the processing of ore is mixed with sea water and transported through a pipeline to the submarine tailing deposit at approximately 300 meters depth, where it accumulates in a subsea delta. The area was selected based on ESIA studies, and estimations and modelling of the expected dispersion and accumulation of tailings in the fjord throughout the Project lifetime.

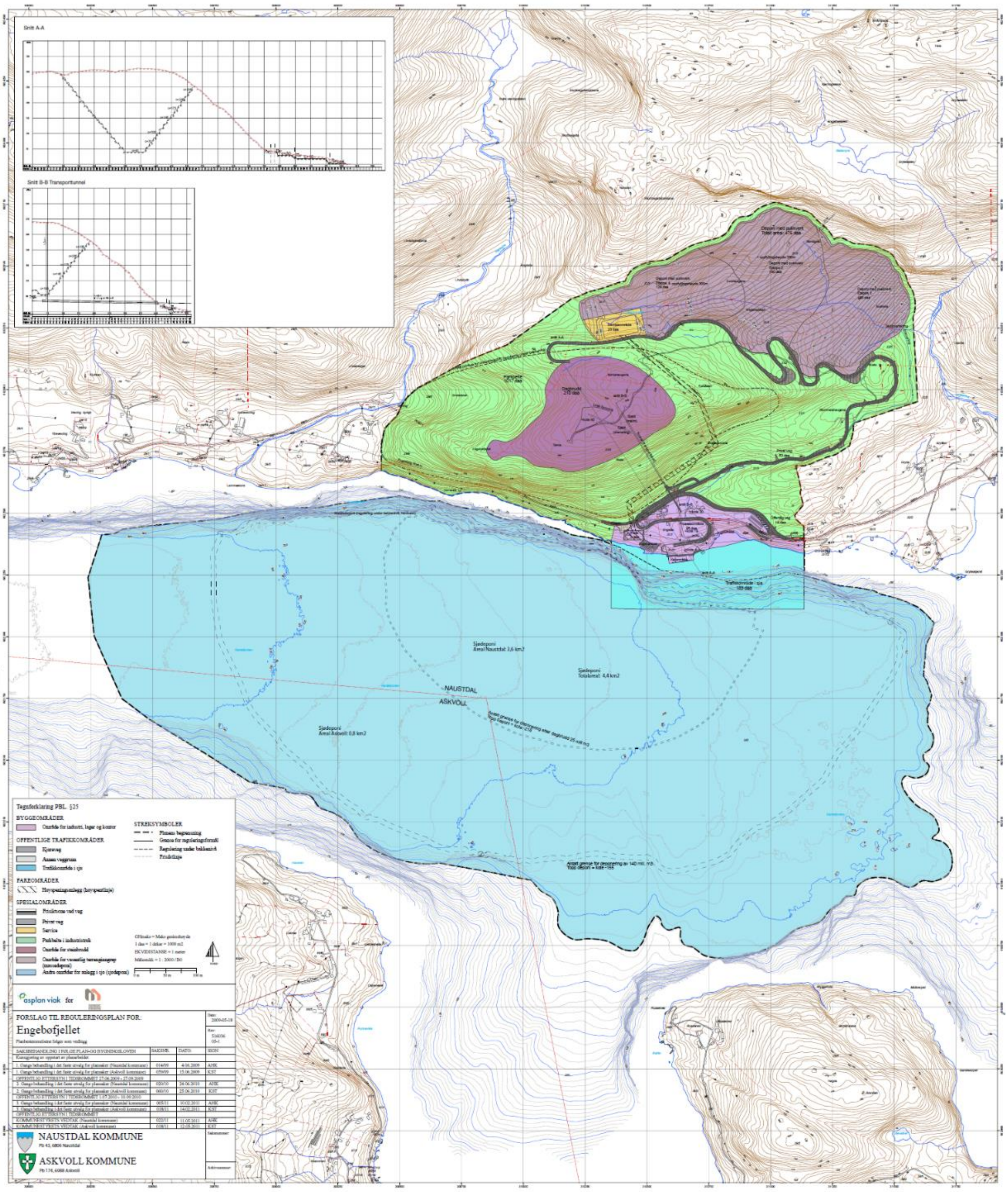

Figure 2-7: Zoning plan of Engebø including area for tailings deposition

The zoning plan allows for, and regulates, the areal disposition of the following activities:

- Process plant site
- Extraction of rock in open pit and underground production
- Service area (workshop)
- Waste rock deposition site
- Access road between the mining operation and the process plant

- Underground infrastructure for ore transportation, primary crushing and storage
- Rerouting of county road Fv. 611
- Sea tailings deposit (STD).

Former Naustdal and Askvoll municipalities were the responsible authorities for the zoning plan. All land-based activities were located within former Naustdal municipality and large parts of the area regulated for STD. A smaller part of the STD was within Askvoll municipality.

An additional detailed zoning plan was requested by Naustdal municipality to add some more definition to the overarching zoning plan. The detailed regulation was solely focused on the terrestrial part of the Project. The DFS and the detailed zoning plan are aligned in all material matters. The detailed zoning plan was granted and made effective on 22 August 2019 by Naustdal Municipality. Figure 2-8 illustrates the detailed zoning plan for the Project.

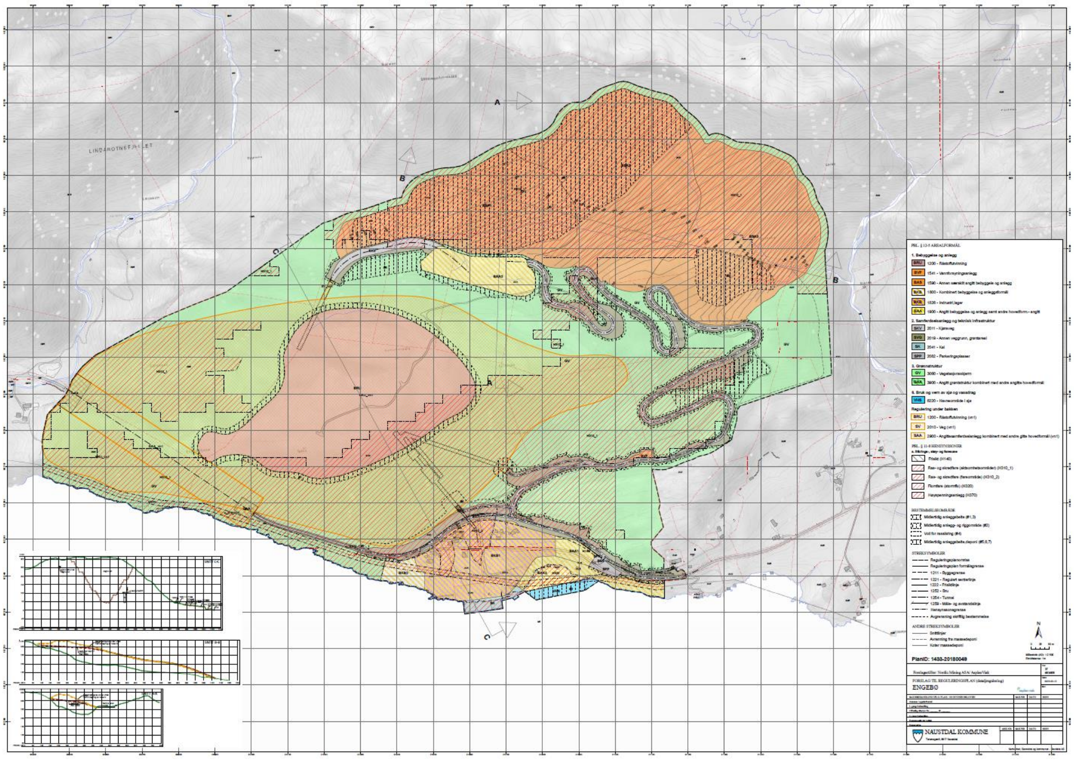

Figure 2-8: Detailed Zoning Plan for the Engebø mining and processing areas

2.4.3 *Environmental Permit*

The final approval of the environmental Permit was issued on 29 September 2016 by the King in Council. The environmental permit is governed under The Pollution Act (1 October 1983) and the responsible authority is the Norwegian Environment Agency. The environmental permit covers license to discharge solids, gas and fluids to the air, water or ground and licences for vibration and noise pollution.

The environmental permit provides limits for discharge to air, fresh water and marine environment, and requirements for environmental monitoring and reporting. Nordic Mining will implement a measurement system to ensure compliancy to discharge limits.

An environmental monitoring program has been developed in collaboration with DNV GL. The program has been submitted to the Environment Agency for approval. Monitoring of key parameters will start approximately one year prior to operation to track background/baseline data. Monitoring of migrating salmon (juvenile salmon migrating through the fjord system from rivers to open sea) will take place during spring 2020 and 2021 to determine the timing of the migration. There is a one month window (15 May – 15 June) where blasting should be avoided due to potential disturbance of migrating salmon. Key requirements for the measurement and monitoring programs are:

- Measurements of particles concentrations and accumulation for STD
- Measurements of dust emissions from operations
- Measurements of noise and vibrations
- Monitoring of effects on fjord biodiversity
- Monitoring of spawning ground for cod.

2.4.4 *Update of chemical use for Environmental Permit*

Chemicals used in the processing and dewatering will be present in low concentration in the tailings discharge. Nordic Mining's environmental permit allows for discharge of five different flotation chemicals and a flocculation agent. The permitted chemicals were based on a process scheme with flotation of rutile. During the subsequent testwork, it was concluded that dry separation (with no chemicals) using magnetic and electrostatic separation was a preferred environmental and economic solution. The rutile flotation stage was therefore redundant. However, a smaller pyrite flotation step was included in order to achieve targeted product quality.

The chemical additives for pyrite flotation include two chemicals; Dow Froth 400 (frother) and SIBX (collector). In addition, a flocculant, Magnafloc 5250, is added to regain freshwater for the process plant. Magnafloc 5250 was found to be more suitable than the permitted Magnafloc 155. Table 2-4 gives an overview of the permitted chemicals in the environmental permit (rutile flotation) and the planned DFS usage for pyrite flotation. The annual consumption of chemical additives is substantially reduced with the DFS process scheme.

Table 2-4: Permitted vs DFS Chemical Additives

Permitted Chemicals (From PFS Study)		Annual Consumption (t/a)
Magnafloc 155	Thickener Flocculant	60
Flotinor FS2	Flotation Collector	240
Flotol B	Flotation Frother	32
Dextrin	Stabilator	120
Sulphuric acid	Stabilator	800
Na-silicate	Stabilator	720
In Total		**1,970**
DFS Chemicals		**Annual Consumption (t/a)**
Magnafloc 5250	Thickener Flocculant	1.34
Sodium isobutyl xanthate (SIBX)	Flotation Collector	1.74
Dow Froth 400	Flotation Frother	2.61
In Total		**5.69**

The environmental permit allows for inclusion of new chemicals, but states that change must be approved by the Environment Agency and in accordance with REACH. Nordic Mining has initiated a process with the Environment Agency in order to seek approval for the new chemicals. The Environmenl Agency has requested additional information on toxicity and degradation of SIBX. Although SIBX is widely used in the mining industry, there is limited data on marine effects. No additional tests where required for Dow Froth 400 and Magnafloc 5250 which are known to have low toxicity. The permitting risk related to Dowfroth 400 and Magnafloc 5250 are regarded to be low.

Environmental Consultant DNV GL has been engaged to assist in the documentation of SIBX. Several toxicity tests and degradation studies have been carried out. The final results of the tests will be available in the first quarter of 2020. Nordic Mining considers permitting risk for SIBX as low if test demonstrates that the concentration of SIBX (in the fjord environment) is close to or lower than the non-effect concentration. Nordic Mining will submit a formal application for substitution of the present chemicals as soon as the test data is ready. The application is planned to be submitted in February 2020 and is estimated to be granted within 2020.

2.4.5 Operational License

The granting of an operational license is regulated under the Mining Act (19 June 2009) and is issued by the Directorate of Mining. The operational licence is concerned with the practical aspects of the mining operation, such as open pit and waste rock storage area stability, safety and closure, as well as mining sequence and mineral resource management. The license, once granted, will regulate terms and conditions for mining operations and security for decommissioning responsibilities. Included in the Directorate's assessment is an evaluation of competencies required to operate the mine in a safe and sound manner.

Nordic Mining filed an application for an operational license with the Directorate of Mining in early February 2019. A mine plan describing detailed aspects of the mining operation, as well as operational procedures, operational safety, geotechnical parameters and closure planning was included. The application was subject to a mandatory consultation/hearing process that ended in November 2019. An approval of the operational license is expected in the first quarter of 2020.

2.4.6 Zoning Plan for Water Supply

Fresh water to the process plant and project facilities will be sourced from the Nedre Markevatn powerplant in the Skorven area in Askvoll municipality.

Water supply is generally regulated by the Norwegian Water Resources and Energy Directorate through the Water Resource Act (1 January 2001). The water source for the Nedre Markevatn powerplant is the Skorven watercourse. The watercourse is used for hydroelectric production in accordance with a separate license.

A zoning plan for the supply pipeline from the powerplant to the process plant at Engebø was required by Askvoll and Naustdal municipalities in December 2017. Several ESIA studies were initiated for land and marine baseline studies, cultural heritage investigations, as well as assessment of alternative pipeline pathways. The zoning plan was subject to a public hearing that ended in May 2019. The municipality administrations in Askvoll and Naustdal concluded that the ESIA documents limited negative impact on the natural environment and land use, and that the plan satisfies the formal requirements of a zoning plan.

Nordic Mining expects the zoning plan to be granted by Sunnfjord and Askvoll municipality councils in the first part of 2020. No major risks for refusal of project delay have been identified.

2.5 Physiography, Accessibility and Infrastructure, Climate and Local Resources

2.5.1 Physiography

Engebø is the local name of the hill which contains the Deposit. The hill varies in elevation from sea level to approximately 335 meter above sea level and runs parallel to the Førde Fjord. The Deposit is outcropping on the top.

2.5.2 Accessibility, Infrastructure

The Project site at Engebø is located near the Fv 611 county road that runs alongside the Fjord. There is a small access/haul road from the Fv 611 county road to the top of the Engebø hill.

A closed, small quarry and a quay which were constructed in the 1990’s for shipping of armour stone is located in the eastern part of the deposit area. The quay which holds good standard is designed for vessels with a capacity of up to 80,000 tonnes and provides direct access to the North Sea and international ports.

Fresh water for the process plant will be sourced from the south side of the Førde Fjord and transported to site via a dedicated pipeline across the fjord.

Electricity for the operations will be sourced from a connection to the 22 kV grid that passes across the Project site. In addition to upgrading the existing grid, a new grid line, forming a supply loop to the Project site, will follow the pipeline for fresh water to the Project site.

2.5.3 Climate

The climate at Engebø is typical for the western Norway coastal climate and is characterized by long, warm days in summer and colder, darker and shorter days in winter. Snow is common in winter but due to the proximity to the sea and the relatively low altitude there are no permanent freezing or snow accumulation and operations can be run year around. Rainfall exceeds 2,000 mm a year, through all four seasons. The fjord is permanently ice-free.

2.5.4 Local Resources

The nearest town, Førde, with a population of about 10,000 people, is located about 30 km east of Engebø, at the inner most part of the Førde Fjord. Førde is a regional centre and the largest city on the west coast of Norway between Bergen in south and Ålesund in north.

2.6 History

2.6.1 Prior and Current Ownership

The Deposit was not systematically explored until the 1990s when DuPont made claims for exploration of rutile. DuPont initiated several exploration and beneficiation programs qualified the initial Exploration Rights to become Extraction Permits under the Norwegian mineral law regulations.

The company Fjord Blokk AS initiated a small-scale quarrying operations in 1998, with production of armour stone (block stone) in the eastern part of the deposit.

In 1998, DuPont placed its mineral interests at Engebø in the subsidiary Conoco (later ConocoPhillips). ConocoPhillips did not undertake further exploration of the Engebø Deposit. In September 2006, Nordic Mining acquired the Extraction Permits from ConocoPhillips.

Since 2011, the permits have been held by Nordic Mining's wholly owned subsidiary Nordic Rutile AS.

2.6.2 Historic Development of the Project

The Engebø Deposit was first recognized as a rutile deposit in the 1970s, after development of a local road tunnel (county road Fv611).

DuPont carried out comprehensive drilling and sampling programs in the period 1995 to 1998. The work was done with assistance from the Geological Survey of Norway (NGU).

Nordic Mining's focus in the first years after the acquisition of the Extraction Permits in 2006 was to prepare for permitting of the use of land for the contemplated mining operation and for safe disposal of tailings and other environmental matters related to the Project. A scoping study published in 2008 included the first mineral resource estimations for the Project (rutile only) in accordance with the JORC Code.

Comprehensive environmental impact assessment studies were carried out between 2008 and 2015. In 2015, the zoning plan (industrial area plan) and a discharge permit (environmental permit) for the Engebø Project were approved.

In early 2016, Nordic Mining initiated a drilling campaign to improve the resource classification and to quantify the garnet content of the deposit.

A Prefeasibility study (PFS) for the Project was published in 2017 substantiating a profitable rutile and garnet project at Engebø.

In 2018, a limited drilling program was carried out at Engebø. The aim was to increase the knowledge of the ore body and the geotechnical conditions in the open pit.

In February 2019, Nordic Mining filed an application for the operational license for the Engebø Project with the Norwegian Directorate of Mining. The public hearing process ended in November 2019.

In August 2019, the Naustdal and Askvoll municipalities approved the detailed regulation plan for the mining, service and process plant areas including access and haul road, security fencing etc.

Nordic Mining's proposal for a zoning plan related to the supply of water and hydroelectric power to the Project site has been on public hearing in Naustdal and Askvoll municipalities.

2.7 Geology and Mineral Resources

2.7.1 Geology

The Engebø deposit is one of the world's highest-grade rutile (TiO_2) deposits as well as being unique for its substantial content of almandine-type ($Fe_3Al_2Si_3O_{12}$) garnet. It is formed through early Devonian high-grade, eclogite facies, metamorphism of a Proterozoic ilmenite ($FeTiO_3$) enriched gabbroic protolith. As a consequence of the formation of the deposit, the content of rutile and garnet is typically linked so that higher grade ore (high TiO_2) hosts garnet with a higher almandine component (represented by increased Fe) compared to lower grade ore. The correlation between rutile and garnet content in the deposit is illustrated in Figure 2-9 below.

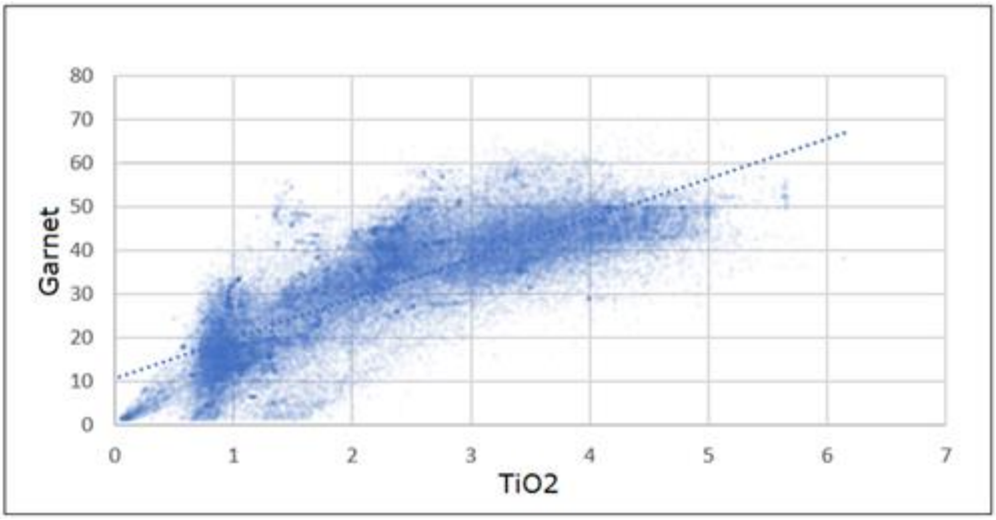

Figure 2-9: Correlation Between Rutile and Garnet Content in the Deposit

With negligible contents of radioactive elements and heavy metal contamination, the deposit is a clean source of high-grade titanium and garnet.

The deposit forms a roughly 2.5 km x 0.5 km E-W trending lens situated in a Proterozoic gneiss, with an overall dip to the north of approximately 85 degrees. Drilling has not yet reached the depth of the deposit, but it has demonstrated a span of at least 500 m vertical, from the surface in the east to the deepest drill holes in the west. The centre of the eclogite lens is well preserved with limited alteration, foliation and shearing. Towards the contact to the surrounding gneisses, the amount of deformation and alteration in general increases, and the eclogite is progressively more deformed and altered to amphibolite facies lithologies. The contact zone to the gneiss is typically defined by an intensively sheared and folded mixture of alternating mafic (eclogite and amphibolite) and felsic (gneiss) lithologies.

Based on varying contents of Fe and Ti, the Engebø deposit has been subdivided into three main types:

- **Ferro Eclogite** is defined by Fe_2O_3 > 16% and TiO_2 > 3%
- **Transitional Eclogite** is defined by 14-16% Fe_2O_3 and 2-3% TiO_2
- **Leuco Eclogite** is defined by Fe_2O_3 < 14% and TiO_2 < 2%.

In addition to the above classification, the Ferro and Transitional Eclogite is further subdivided into a total of 8 ore sub-types based on mainly textural characteristics. Compared to the Ferro Eclogite, the Leuco Eclogite is brighter in colour and less dense due to the increasing content of felsic minerals. Figure 2-10 shows the distribution of the main eclogite subtypes in the surface of the deposit.

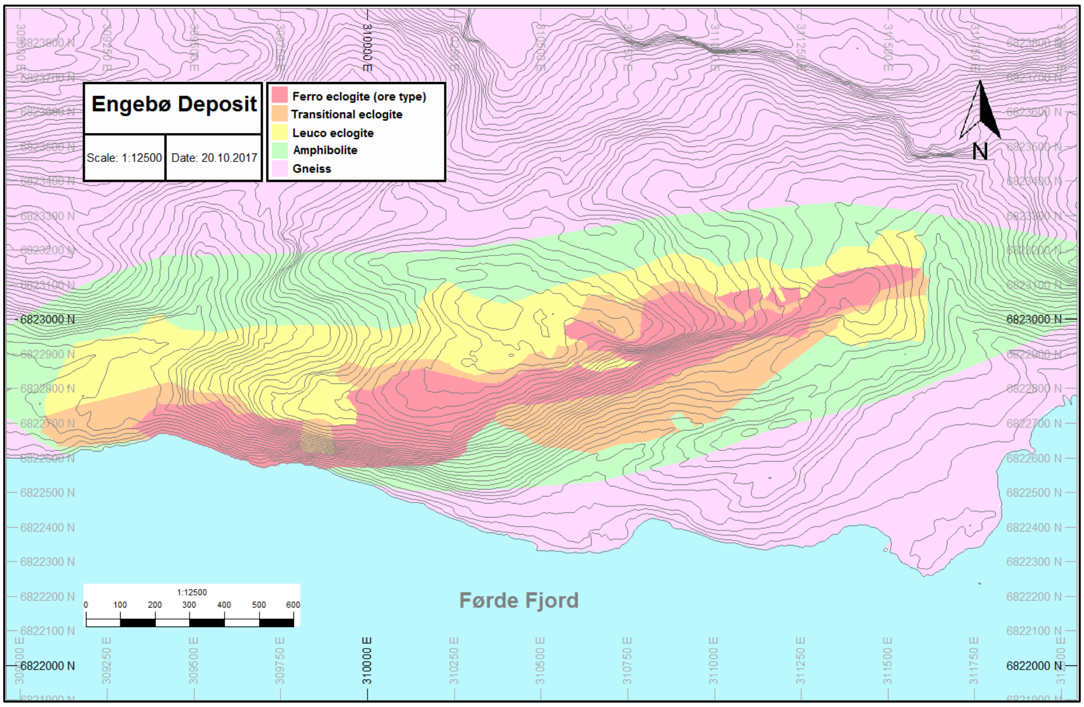

Figure 2-10: Geology of the Engebø Deposit

In Ferro Eclogite, rutile is typically the fourth most abundant mineral representing up to 6% of the mineral composition. Rutile is the most common Ti bearing mineral in the deposit and accounts for, in average, >95% of all the TiO_2 in the Ferro and Transitional Eclogite lithologies. The exception is in local, highly altered zones where significant amounts (represented by >15% of the TiO_2) of rutile breaks down to form ilmenite. Typically, the in-situ rutile grain size is between 100 and 300 µm, but in zones with a more developed foliation the grain size distribution has a somewhat finer distribution.

Garnet is typically the most abundant mineral with concentrations up to 50%. The garnets are dominated by the almandine end member (Typically >55% of the end member composition) with the grossular and pyrope end members representing the remaining mineral chemistry Garnet in Leuco eclogite has a lower almandine component and more secondary mineral inclutions compared to garnet in Trans and Ferro Eclogite and is hence considered to be of a lower quality from a product point of view. Due to a near complete recrystallization at peak eclogite facies conditions the garnets in the Trans and Ferro eclogite are homogenous in terms of chemical zonation and is low on mineral inclusions. In general, the in-situ garnet grain size is between 200 and 600 µm. Some zones in the deposit contains cm-sized garnets. These garnets, however, are known to have a higher amount of mineral inclusions as well as chemical zoning. Hence, they are considered to represent a poorer quality in terms of commercial application and products.

The structural geology in the Engebø deposit is dominated by folds, shear zones and foliation. The mechanism behind this deformation is interpreted to be a top-to-left E-W shearing combined with a N-S shortening.

2.7.2 *Ore Characterization and Resource Data Verification*

The ore characterization is based on three drilling campaigns as can be seen in Table 2-5 and the geographical positions can be seen in Figure 2-11

Table 2-5: Overview - Historical and Recent Drilling Campaigns

Drilling Campaign	Focus Area	Drillholes	Core Size	Length (m)	Average Length/ Hole (m)
1995 - 1997 DuPont/Conoco	Western part	49	BQ	15,198	310
2016 Nordic Mining	Central part (Open pit)	38	NQ2	6,348	167
2018 Nordic Mining	Central part (Open pit)	10	NQ2	1,581	158

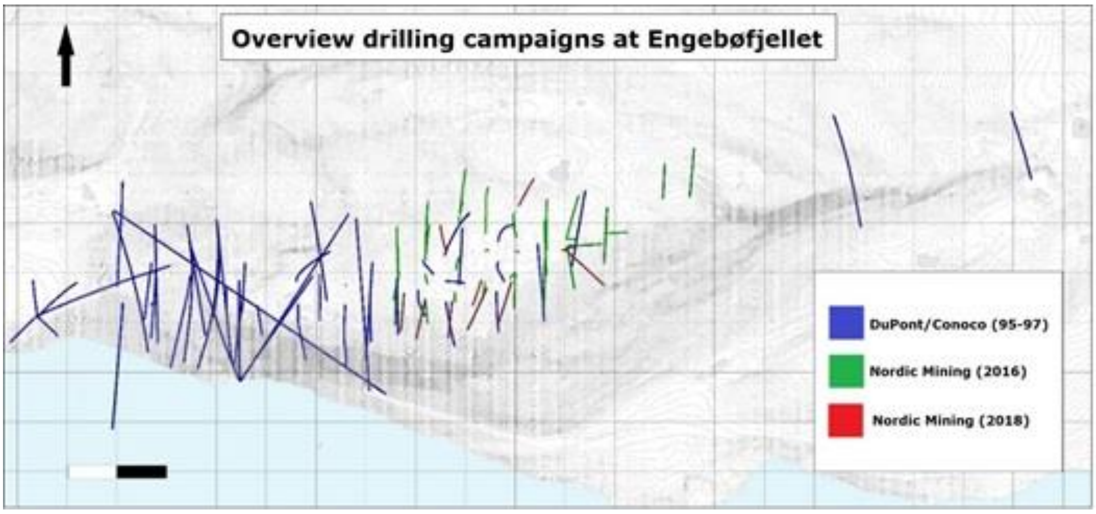

Figure 2-11: Overview drill hole positions in historical and recent drilling campaigns

The DuPont/Conoco (1995/1997) drilling was focused the western part of the deposit A few holes were also drilled further east to define the resource. A total of 15,198 meters of BQ drill core was recovered. Sampling along the tunnel and shore line, trenching and surface sampling was also carried out to supplement the drill hole data. A portable XRF was used as the main acquisition method for chemical data. This was done on 25 cm intervals along most of the drill core and the data were corrected against 116 whole rock XRF assays of drill core composites. No specific QA/QC program was followed, and no specific geotechnical investigation was carried out.

The 2016 and 2018 drilling campaigns carried out by Nordic Mining were executed according to the JORC code. Competent Person Adam Wheeler, was engaged to assist in the planning and execution of the drilling campaigns and to model the ore deposit and qualify the resource according to the JORC. NQ2 cores were drilled in a 40*60 meter grid focusing on the open pit ore, representing the first years of mining. The aim of the drilling programs were to improve understanding and classification of the resource for a PFS/DFS level, quantify the garnet and provide geotechnical input for mine modelling. No attempt was made by Dupont to quantify garnet who's focus was mainly on rutile.

The result of Nordic's drilling was an increase in measured and indicated resources especially on top of the Engebø hill in the area planned for open pit mining. Whole rock XRF assays were done for 5 meter ore composites on all drill holes. An extensive Quality Control and Assurance (QAQC) program was executed in order to assure high standards and JORC compliancy. The garnet content was quantified based on a combination of Qemscan and chemical calculations, and qualitative measurements were carried out to investigate grain size and variations. The geotechnical drilling resulted in increased understanding of the mining conditions and allowed for more progressive mining.

The following ore characteristics were recorded for all drill holes for the 2016 and 2018 campaigns:

- **Geological logging:** 20 mineralogical and textural features were logged based on visual observations
- **Ore type characterisation:** Based on primarily textural characteristics the Transitional and Ferro Eclogite were logged based on 8 different sub oretypes
- **RQD:** Rock Quality Designation were done for all drill holes
- **Density measurements:** For every 25 meters and used for tonnage calculations
- **Chemical assaying:** All ore were assayed by whole rock XRF. In addition, for all ore samples Ti-distribution between ilmenite and rutile is assayed based on HCl dissolution and ICP-MS
- **Garnet grade estimation:** Based on correlation between XRF assays and garnet Qemscan data (from 179 samples)) a relationship between garnet grade and the chemical content (Fe, Al, Mn and Na) was established. Where only data from 1995/1997 drilling campaign is available the correlation is done directly based on iron content
- **Garnet grain size:** Garnet grain size is physically measured through a microscope on 162 samples represented by thin sections of various ore types spaced throughout the volume representing the first pushback in the open-pit.

The QA/QC program in the 2016 and 2018 campaign followed the system with respective acceptance criteria as presented in Table 2-6. For both campaigns all items passed the QA/QC criteria.

Table 2-6: Overview of QA/QC Program Followed in the 2016 and 2018 Drilling Campaigns

Evaluation Parameter	Type of Sample	Frequency (%)	Process Evaluated	Acceptance Criteria
Precision	Field duplicate	2	Precision of taking samples	≤10% failed samples
	Coarse duplicate	2	Precision of taking samples	≤10% failed samples
	Pulp duplicates	2	Precision of analysis	≤10% failed samples
Accuracy	Standard samples	6	Accuracy with respect to primary lab	Bias ≤5%
	External duplicates	4	Accuracy with respect to secondary lab	Bias ≤5%; adjusted R2 = 1
Contamination	Coarse blanks	2	Contamination during sample preparation	Contamination ≤2%
	Fine blanks	2	Contamination during analysis	Contamination ≤2%

In 2016 Nordic Mining carried out a verification of the 1995/1997 drill core data based on reinvestigating the older core material. 709 meters or Ferro and Transitional Eclogite was relogged and re-assayed, representing 6% of the total 1995/1997-drill cores and 22% of the 1995/1997 drill cores within the open pit. Favourable results were achieved from every aspect of the analysis, and it was concluded that the historical data could be used for resource estimation for all resource category levels.

Competent Person Adam Wheeler states that the geological data used to inform the Engebø resource estimation have been collected in line with good industry practice, allowing the results to be reported according to the guidelines of the JORC code (2012). It is considered that all available data is suitable for use in the estimation of all resource categories, including:

- DuPont/Conoco diamond drillhole data
- DuPont/Conoco surface data
- 2016-2018 Nordic Mining diamond drillhole data
- 2016 Nordic Mining surface sample data.

2.7.3 Mineral Resource Estimate

The mineral resource estimation for the Project was done by Competent Person Adam Wheeler using Datamine Software. The data used for the resource estimation was based on drill hole data and surface sampling from the three campaigns mentioned in Section 2.7.2

The main lithology and ore type boundaries were modelled creating wireframes in Datamine.

All samples from the data acquisition campaigns were converted into 5 meter composites.

A volumetric model was created based on the lithology wireframes. The default block was 15 x 15 x 15 meters and filler blocks down to 5 x 5 x X meters (where X will be determined by the best fit). The topographic model restricted the volumetric model against the surface, and blocks inside the 50-meter fjord perimeter were flagged since they were classified as unavailable.

Grade estimation was done based on Kriging Neighbourhood Analysis using three searching parameters including the search distances applied as well as the minimum and maximum of composites and drill holes. TiO_2 and Fe_2O_3 grades were estimated using ordinary kriging and all other grades are estimated using inverse-distance weighing. Dynamic anisotropy was applied in the estimation process to orient the search ellipsoids approximately parallel to the lithology zone geometries.

For the resource classification the following classification criteria was used for searches:

- **Measured:** At least three drill holes, and samples present in at least 3 octants within a search of 40 x 40 x 24 meters
- **Indicated:** At least 3 drill holes, and samples present in at least 3 octants, within a search of 75 x 75 x 45 meters
- **Inferred:** Within interpreted structures and limited by a maximum extrapolation of 180 meters (down-dip) or 120 meters (along-strike) from available sample data.

The model was validated by the following steps:

- Examination of model/sample cross-section
- Block volume checks
- Comparison of global averages
- Comparison of local averages
- Historical comparisons.

A mineral resource estimate was made based on an ore model by Adam Wheeler. The resource classification is illustrated applying a 2% TiO_2 cut-off. This represents the ferro and transitional eclogite ore types which are regarded as economically feasible resources.

Table 2-7: 2019 Mineral Resource Estimate (2% TiO_2 Cut-off)

TiO_2 Cut-off	Classification	Tonnes (Mt)	Total TiO_2 (%)	Garnet (%)
2%	Measured	29.2	3.60	44.5
	Indicated	104.0	3.48	43.9
	Total – Measured and Indicated	**133.2**	**3.51**	**44.0**
	Inferred	254.1	3.15	41.3

2.7.4 Ore Reserve Estimate

An ore reserve estimate was made by Competent Person Adam Wheeler based on the resource model and Hatch's open pit and underground mine plans. The mine plans were reviewed and qualified by Mr. Wheeler. Table 2-8 shows the ore reserve estimate for the open pit and underground:

Table 2-8: Ore Reserve Estimate[5]

Open Pit	Tonnes (Mt)	TiO_2 Grade (%)	Garnet Grade (%)
Proven	21.07	3.54	43.8
Probable	13.18	3.29	43.3
Total Open Pit	**34.26**	**3.45**	**43.6**
Underground			
Proven	2.35	3.34	39.2
Probable	26.49	3.21	38.7
Total Underground	**28.85**	**3.22**	**38.7**
Grand Total	**63.10**	**3.34**	**41.4**

The ore reserves were calculated from the mining schedule with the following assumptions:

- Only Ferro Eclogite and Transitional Eclogite zones were included in ore
- Only Measured and Indicated class were included, with no inferred material reported as ore reserves
- All Inferred material and all other zones are reported as waste
- The open pit was constrained to within the owners boundary
- 50 m safety zone between underground mining and the open pit, topography and the fjord
- A 2% rutile cut-off was applied in the recovery curves due to concentrate grade considerations
- 3 m dilution was applied in the resource model on all ore boundaries.
- The FOB-price for rutile at USD 1,142 per tonne (2019 dollars) for a 95% TiO_2 rutile concentrate, and average FOB-price for a 92% garnet concentrate at USD 248 per tonne (2019 dollars).

[5] Due to rounding of numbers, small deviations can be seen

2.7.5 Geotechnical Studies

SRK conducted a DFS geotechnical investigation, analysis, and development of slope design criteria that substantiates the previous geotechnical work completed on the Project. Analysis of drill core and development of rock mass characteristics indicates a very competent rock mass for all lithologies that will be present within the final pit wall. Furthermore, finite element analysis of the whole slope stability returns high safety factor values in relation to failure through the rock mass and, as such, any significant instability within the proposed pit walls is likely to be controlled by in-situ structure.

Nordic Mining's drilling campaigns focused on positioning geotechnical drill holes to intersect the proposed pit walls. Several holes were surveyed by optical and acoustic tele-viewing. In addition, spinner tests were done on a number of drill holes together with a suite of laboratory tests for defining intact rock strength and discontinuity shear strength to substantiate extensive point load testing. Structural mapping and modelling was also undertaken.

A brief summary of results, findings and comments from SRK follows:

- **Rock mass strength:** The rock was characterized as very to extremely strong returning RMR89 values in excess of 70
- **Structural analysis:** SRK undertook kinematic analysis of the pit slopes. A domain in the east was identified as a higher risk than the rest of the open pit, and here the berm width was set to 6 meters versus 5 meters as for the rest of the open pit
- **Rockfall analysis:** Trajec3D was used for analysing the rockfall for verifying the berms. The result was that majority of the cubic blocks would be retained on the first or second bench below the seed point. The risk with rockfall of blocks is considered low
- **Finite element analysis**: Finite element analysis (RS2) was undertaken to define safety factors for the entire slope along three geotechnical cross-sections developed to intersect the highest section of the north, south and east slopes. Several different models and parameters were assessed and all returned factor of safety in excess of 3. Due to the high factor of safety it was considered unnecessary to run probabilistic analysis
- **Proposed slope geometry**: Two domains were proposed: Domain 1 covers most of the open pit while Domain 2 covers a relatively small portion in the east. Domain 1 will have a maximum inter-ramp angle of 63° and Domain 2 will have a maximum inter-ramp angle of 60°. The only difference between the two domains is the difference in berm width as described above
- **Underground infrastructure**: One of the drill holes in the 2018 drilling campaign intersected the area for underground infrastructure. No signs of poor ground were noted in the drill core. Finite element modelling of the interaction between the proposed infrastructure and the pit slope returned a Strength Reduction Factor of >3.5. No tangible displacement is evident.

The proposed inter-ramp angles are considered achievable given the existing dataset, high quality final slope blasting practices, state of the art slope monitoring and a rigorous Ground Control Management Plan will need to be implemented to provide the best opportunity to safely achieve such angles. In addition, a constant geotechnical mapping program, interpretation, updated analysis and if required modifications to interim and final slope design will be required when mining commences.

2.8 Mining

The Engebø Project provides easy access to high grade ore with limited waste stripping.The open pit is restricted from boundaries in the zoning plan, depth of the pit and practical mining width. Mining will progress underground with access from the open pit once the pit is depleted. The underground design and schedule is currently at PFS level and will progress to DFS level during the open pit mining. Low/medium grade ore is stockpiled, improving the feed grade to the plant. The stockpiled ore will be utilized after the underground operation finish.

2.8.1 Open Pit Mining

Open pit mining was informed by the data from the PFS, additional information from resource and geotechnical drilling and from an improved understanding of the resource, processing results, geotechnical conditions and operational parameters. Table 2-9 lists the areas assessed prior to the final DFS pit design.

Table 2-9: Additional Iterations Carried Out After the PFS

Study Area	New Information
Inclusion of Transitional Eclogite ore into the plant feed	Process testwork
Updated slope angles	Geotechnical drilling
Conversion of Inferred resources	Resource and geotechnical drilling
Dilution, mining volumes and fleet selection	Updated resource model
Stockpiling and cut-off grade analysis	Process testwork

The results of the various trade-off studies were incorporated into the pit optimization.

2.8.1.1 Pit Optimization

The pit optimization showed that the final pit was insensitive to mining costs and process recoveries due to the low stripping ratios, the limitation imposed by the pit boundary, and the relatively large difference between mining and processing costs. The pit design is sensitive to the slope angles due to the high grade ore in the south wall of the pit. Any increase in slope angles adds significant high grade ore to the pit design.

The chosen pit shell from the optimization delivered:

- 34.4 Mtons of ore
- 18.8 Mtons of waste.

NPV Scheduler was used to optimize the pit using a “Net Smelter Return” (NSR) approach to incorporate all costs and contributions from both the rutile and garnet ore. Both Ferro Eclogite and Transitional Eclogite were considered as possible ore with recovery curves applied for rutile, coarse garnet and fine garnet. The reduction in recovery with reducing grade ensures that there is little risk of overestimation of recoveries. A 2% cut-off was applied for TiO_2 to ensure that the rutile concentrate grade, (95% TiO2) could be maintained for lower grade ore. In addition, the curve was limited at higher grades to prevent an overestimation of recoveries that could follow from a linear grade-recovery relationship.

The geotechnical domains and slope configuration is shown in Figure 2-12. The increase in inter-ramp slope angles allowed overall angles in the pit optimisation to be increased to between 54° and 58°.

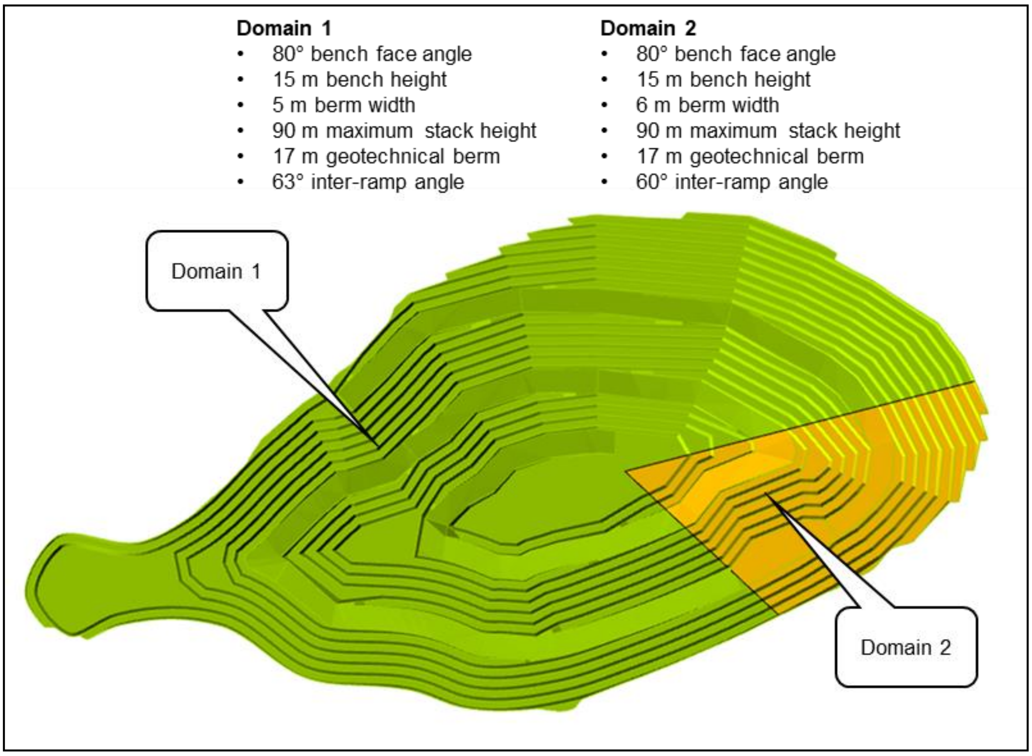

Figure 2-12: Geotechnical Design Domains

In addition to the steeper slope angles, equipment sizes were reduced to allow narrower haul roads. The haul road design at 17 m was based on three times the width of a 64 tonne truck as per the manufacturer’s guidelines, including space for a drain and safety berm.

2.8.1.2 Mine Design

The underground infrastructure for the open pit was paced on the Southern side of the pit considering the following:

- The large excavations were positioned to prevent any interaction with the final pit walls and to ensure positive drainage of any water from the tunnels

- The infrastructure was positioned to avoid the fault identified by geotechnical drilling, illustrated as blue plate in Figure 2-13
- The crusher chamber and silos were aligned to simplify the bulk materials handling.

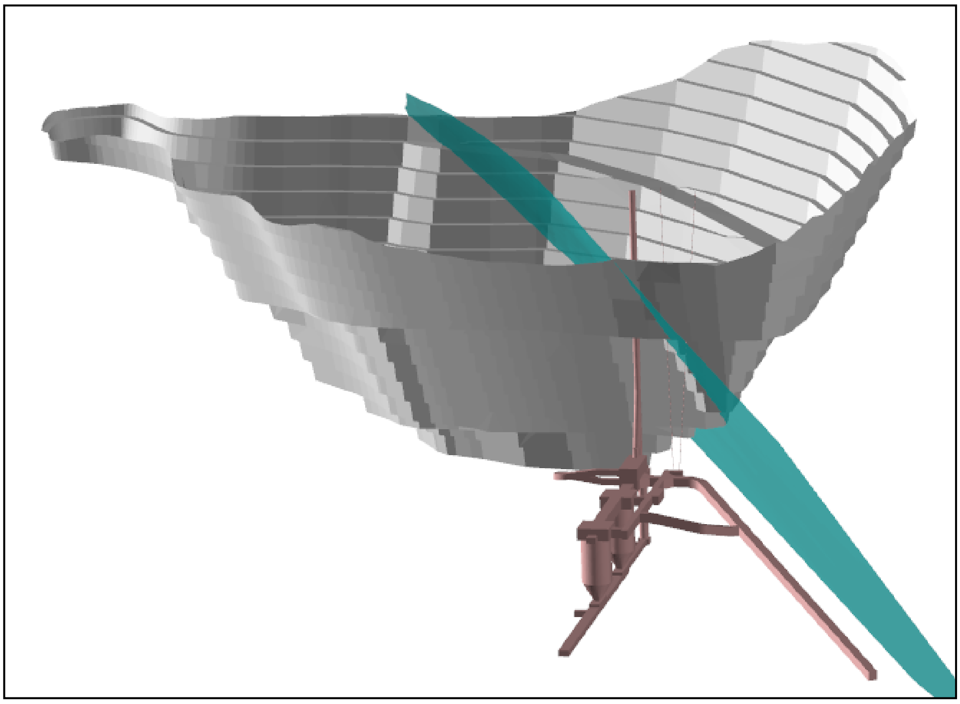

Figure 2-13: DFS Infrastructure Alignment

The pit design was based on the optimal pit from the optimisation, and constrained by the zoning plan. The pushback design employed a similar strategy to the PFS. The following are key characteristics of the design:

- The haul road exit to the waste dump was positioned on the north-western side of the pit as shown in Figure 2-14 and Figure 2-15
- A two cut strategy has been employed to postpone waste and limit mining volumes over the first eight years. The two pushbacks are illustrated in Figure 2-14 and Figure 2-15
- The haul road tunnel position and portal accommodates both Pushback 1 and Pushback 2 positions
- The position of the ore pass in the haul road accommodates both pushback designs.

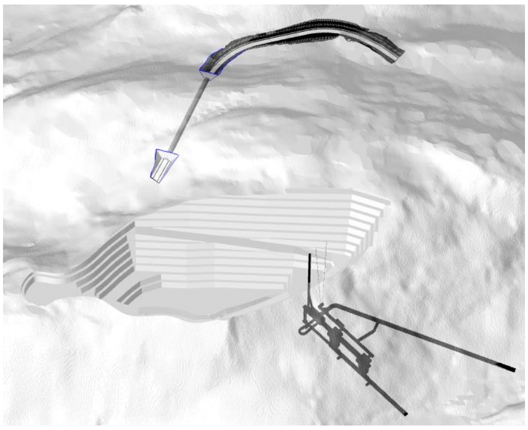

Figure 2-14: Pushback 1 Design

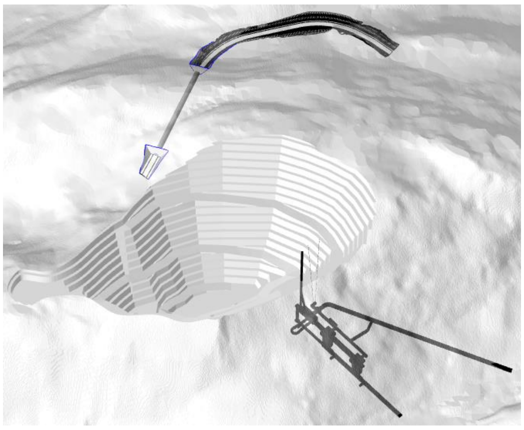

Figure 2-15: Pushback 2 Design

2.8.1.3 Mine Schedule

The first pushback target high grade ore with a low strip ratio. This allows the postponement of high volumes of waste mining until year 8. The production schedule is summarized Table 2-10. The open pit average TiO_2 grade in ROM is 3.85%. By applying an NSR value cut-off, this increases to 3.94% for Pushback 1 with the first four years above 4% TiO_2. The NSR cut-off value does not have a similar effect on the garnet grade, with much smaller relative differences in garnet grade occurring in the high grade deposit.

Since the low value tonnes that are being excluded are mostly due to lower grade transitional ore, the ore stockpile grades are much lower at 2.63% TiO_2 and 39.16% garnet. This stockpiled ore is available for processing at the end of life, but can also be blended into the plant feed if required. The default strategy is to process this ore after all mining has been completed. In addition to stockpiling the low grade ore, the stockpiles has been separated into low grade and medium grade ore with low grade being all ore lower than 3% TiO_2 and medium grade those tonnes above this limit.

Pushback 2 has less potential to optimize grades due to the larger proportion of Transitional Eclogite ore being included. Figure 2-16 shows the mining tonnes over life of mine, clearly illustrating the low stripping ratios during pushback 1.

The different mining phases are overlaping between Pushback 1 and Pushback 2. Although mining in the first pushback continues for 13 years, volumes are supplemented from the second Pushback starting in year 10 with waste stripping for Pushback 2 starting in year 8. The low grade ore stockpiled during the initial years is available to be processed after the open pit, or alternatively during or after the underground mining following the open pit.

Table 2-10: Open Pit Production Schedule Summary

Total Pit		Value
Total Tonnes	tonnes	53,094,180
Waste Tonnes	tonnes	18,785,091
Run of Mine Tonnes	tonnes	34,258,546
Rutile Grade in ROM	%	3.45
Garnet Grade in ROM	%	43.62
ROM in High Grade Plant Feed	tonnes	22,921,821
Rutile Grade in High Grade Plant Feed	%	3.85
Garnet Grade in High Grade Plant Feed	%	45.83
Phase	years	24
Pushback 1		
Total Tonnes	tonnes	32,437,159
Waste Tonnes	tonnes	6,273,611
Total ROM Tonnes to Plant incl. stockpile	tonnes	26,163,548
High Grade ROM	tonnes	16,364,443
Medium Grade ROM	tonnes	2,198,422
Low Grade ROM	tonnes	7,600,682
Rutile Grade in High Grade Plant Feed	%	3.94
Garnet Grade in High Grade Plant Feed	%	45.75
Phase	years	12
Pushback 2		
Total Tonnes	tonnes	20,606,478
Waste Tonnes	tonnes	12,511,480
Total ROM Tonnes to Plant incl. stockpile	tonnes	8,094,998
High Grade ROM	tonnes	6,557,378
Medium Grade ROM	tonnes	-
Low Grade ROM	tonnes	1,537,620
Rutile Grade in High Grade Plant Feed	%	3.67
Garnet Grade in High Grade Plant Feed	%	46.01
Phase	years	7

Total Pit		Value
Ore Stockpiles		
Stockpile Tonnes to Plant	tonnes	11,336,725
Rutile Grade in Stockpile Plant Feed	%	2.63
Garnet Grade in Stockpile Plant Feed	%	39.16
Phase	years	8

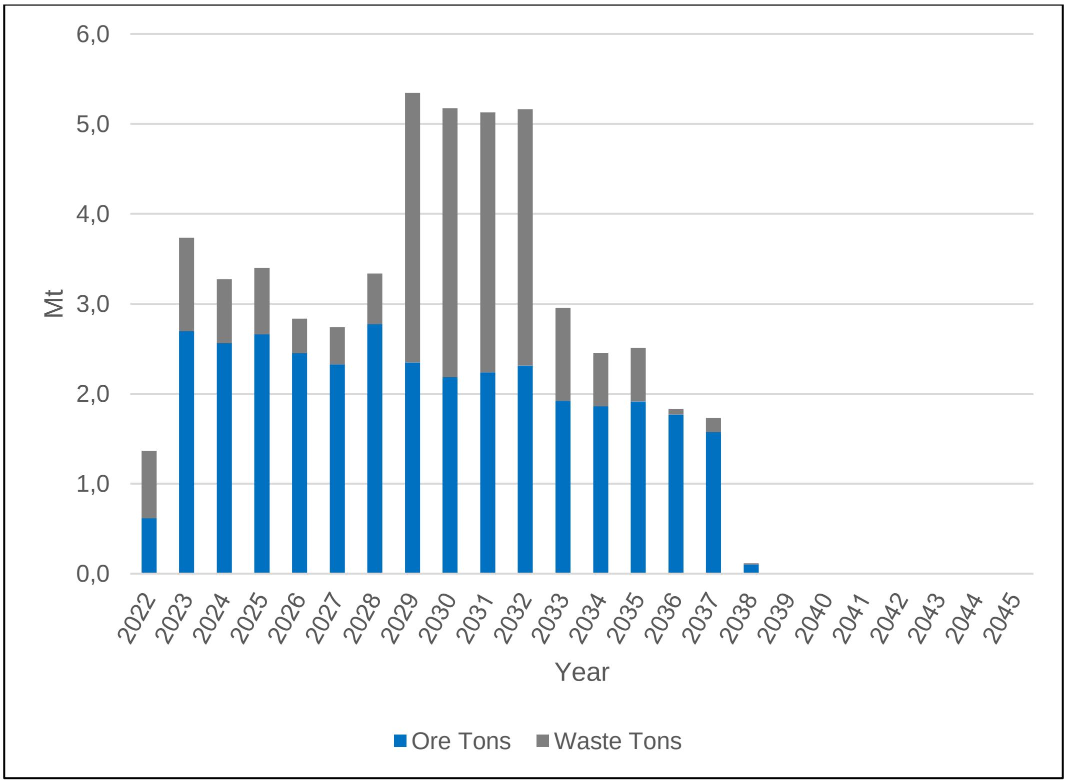

Figure 2-16: Open Pit Mining Schedule

The pit scheduling was linked with a load and haul simulation in the Deswik mining software. This accurately reports all haul routes and tonnes loaded and hauled to each destination over the life of mine. Three dump positions have been specified, with medium grade ore stockpiles closest and the waste dumping furthest from the tunnel position. Once a radial dump reaches its full capacity, it will be dozed to the final contours.

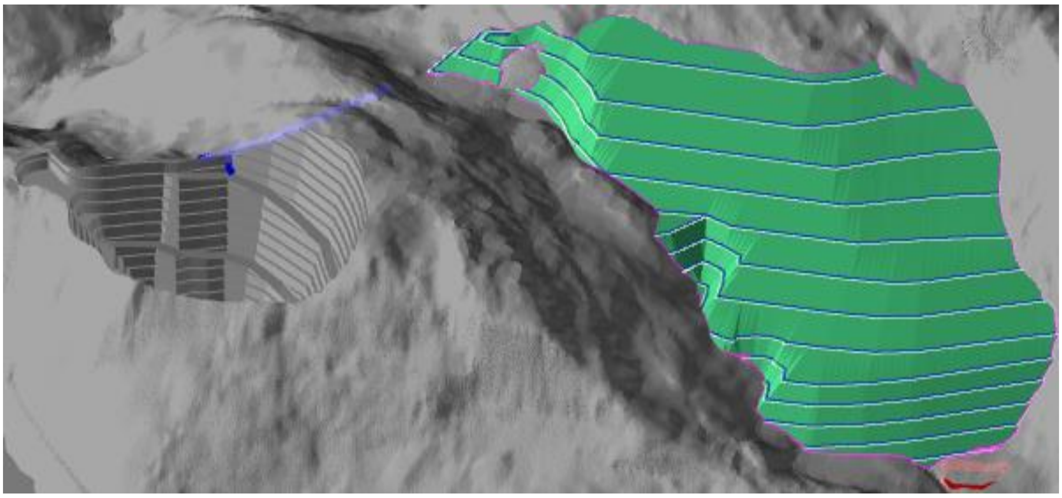

Figure 2-17: Final contours of waste rock deposit

Although the maximum dump sizes are shown in Figure 2-17, there is significant flexibility in the dump strategy. The waste tonnes during pushback 1 are less than 500 ktpa and does not require large amounts of trucking. Similarly, the low grade stockpiling strategy affords the opportunity to optimize the plant feed grade and stockpiling tonnes. The initial mining of the open pit is largely focussed on mining the topography down to the elevation where the open pit crest will be located as shown in Figure 2-18. The benches on the North are the Pushback 1 North wall which will be mined again in Pushback 2. The final benches are only cut after the first five years on the Southern pit perimeter. In addition, the Pushback 1 haul road only commences after the first five years of mining. This provides the opportunity to optimize the mining strategy, change fleet with experience or further improve the pit design.

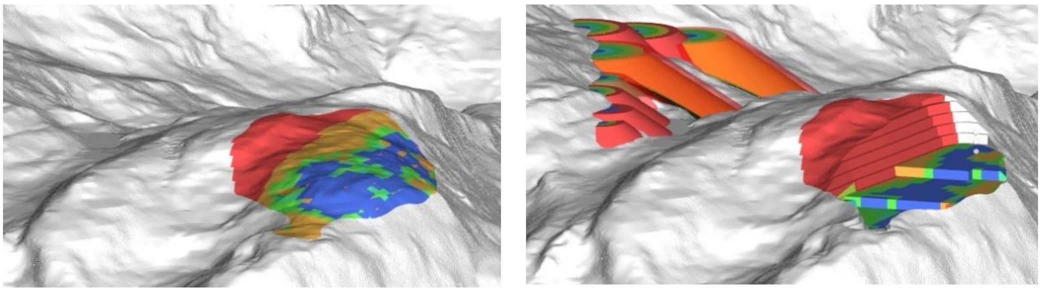

Figure 2-18: First 5 years of mining

The fleet for the open pit mining is listed in Figure 2-13. Since the orepass arrangement facilitates direct dumping with a Front End Loader, the majority of the loading will be done with either only front-end loaders or a FEL, Truck combination. The shovel in a backhoe configuration will be used for selective loading and to prevent spillage down the mountain slopes. Only five trucks are required for pushback 1 at peak, with additional loading and hauling equipment added as volumes increase in pushback 2.

Table 2-11: Equipment List

Equipment	Specification
Trucks	64 tonnes
Front End Loader	10 m^3 bucket size
Hydraulic Shovel	8 m^3 bucket size
Drill	140 to 171 mm diameter DTH drill

In addition to the above production equipment the following support vehicles will also be employed:

- Track Dozer
- Wheel Dozer
- Grader
- Water Truck
- Fuel Truck
- Explosive Truck
- Rock breaker
- Compactor
- Lowbed.

2.8.2 Underground Mining

The underground design was based on the following assumptions:

- Both Ferro Eclogite and Transitional Eclogite ore were targeted
- Stopes were optimized for maximum value by using the Deswik Stope Optimizer together with a manual optimization approach using the NSR methodology as applied for the open pit
- The use of specialized underground machinery maximize the low cost stoping tonnes
- The underground design was adjusted to accommodate the final open pit shape
- Underground infrastructure was adapted to the final open pit infrastructure design.

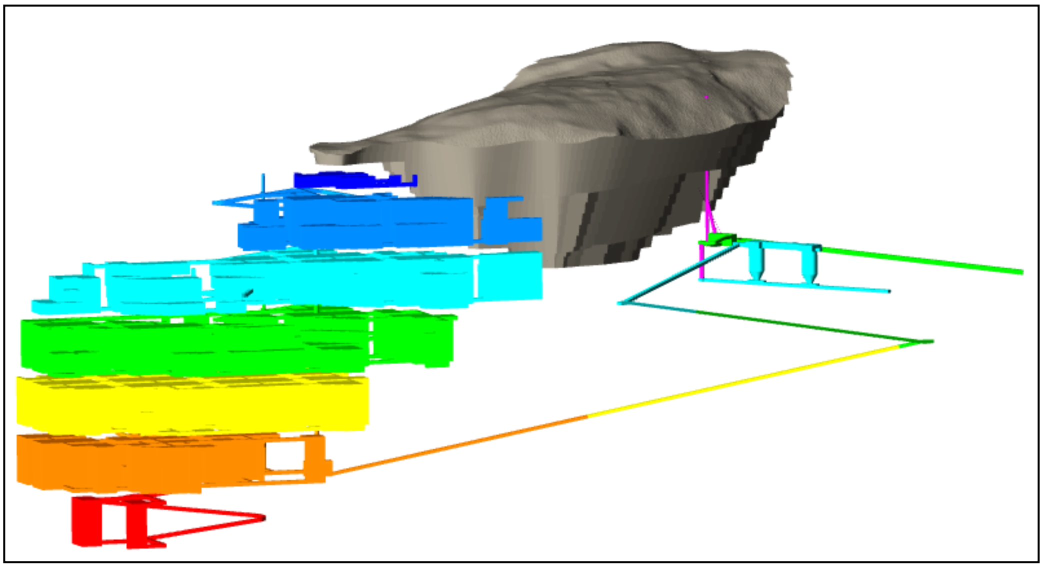

Figure 2-19: Underground Design with Open pit and Infrastructure

The use of underground equipment allowed the proportion of stoping to development to change by mining smaller slots in the stope preparation phase. Initial slots at the top and bottom of the stope was reduced to 5 m high, leading to the stoping height increasing from 30 m to 50 m. In this way more volumes are mined at the lower bulk mining costs, while less volumes are extracted using more expensive development rates.

The underground mining was modelled to start after the open pit in the financial model. However, there is an opportunity to start the underground much earlier to bring this value forward. Some of the options than may be considered are:

- Start with the development of the underground during mining of Pushback 2 to enable underground production to start as Pushback 2 finishes
- Blend the underground production with Pushback 2 by starting it after Pushback 1
    - This would reduce the stripping requirement
- Target high grade areas in the underground to prolong the high grade stream from Pushback 1 by blending both production sources
- Expand production by adding the underground to the open pit mining.

The preferred strategy to phase in underground mining can be defined in more detail during the initial years of mining of Pushback 1.

The underground bulk mining design does incur large amounts of dilution on the periphery of the orebody leading lower grades than the open pit mining. The use of specialized underground long hole drilling equipment may allow targeting of the ore contact without being restricted to a rectangular shape. In this way the stopes on the edges of the orebody can be optimized for less dilution in future providing potential economic upside. At present these design options have not been scheduled, with the design only considering vertical drilling.

Table 2-12: Underground Production Schedule Summary

Total Pit		Value
Total Tonnes	tonnes	30,339,226
Waste Tonnes	tonnes	1,493,630
Run of Mine Tonnes	tonnes	28,845,596
Rutile Grade in ROM	%	3.22
Garnet Grade in ROM	%	38.68
Phase	years	19

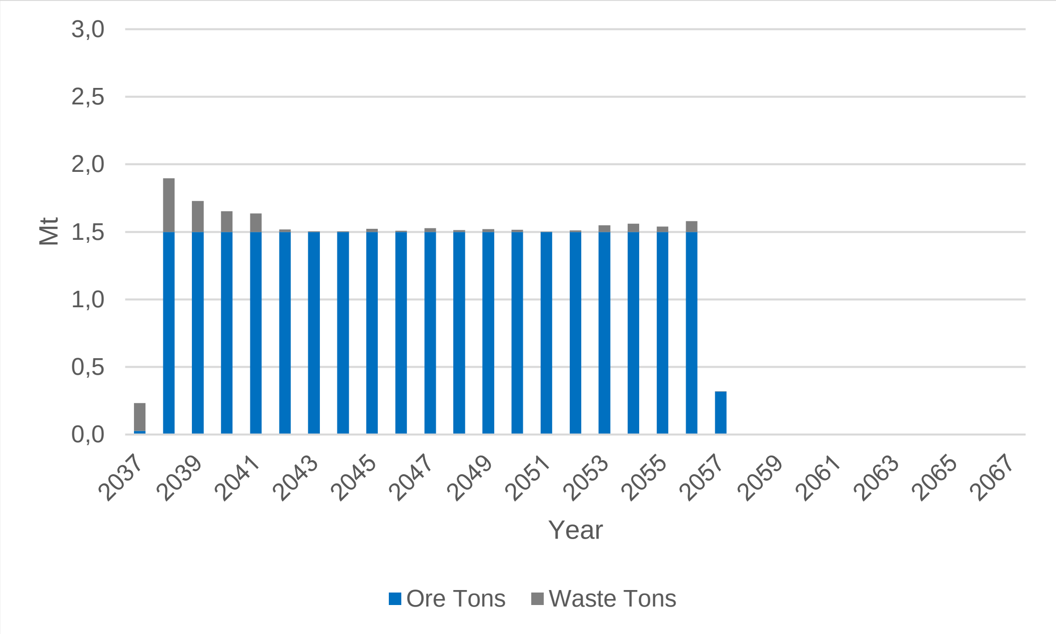

Figure 2-20: Underground Production Schedule Tonnages

2.8.3 Combined Open Pit and Underground Mining

The underground mining tonnes follows on the open pit as illustrated in Figure 2-21, with the reclamation of the stockpiles only happening at the end of life. Alternatively, the underground and/or stockpiles can be blended into the open pit production extending the life of the open pit. These options would be further developed during the underground feasibiliy.

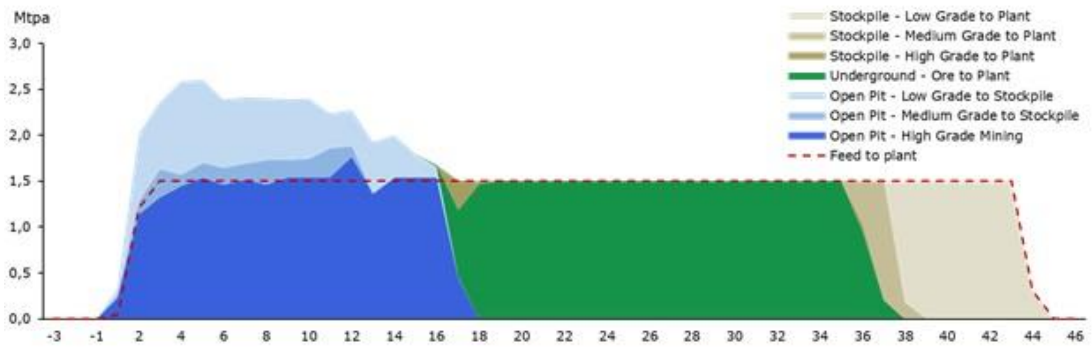

Figure 2-21: Combined Open Pit and Underground Mining Tonnes

2.9 Process Plant

2.9.1 Process Circuit Development

In late 2016 IHC Robbins, Brisbane Australia, was engaged to complete the metallurgical process development testwork for the PFS for Engebø Project. The testwork focused on the development of a flowsheet suitable for producing rutile and garnet products from crushed/ground Engebø ore. This work resulted in the development of a flowsheet, using typical mineral sands process methodologies and equipment, and a metallurgical process similar to that used within other mineral sands operations. This flowsheet led to the successful completion and delivery of the PFS in October 2017.

A significant amount of additional testwork has since been completed during the DFS with the focus on process optimization, reducing process related risk, and increasing overall process confidence. Metallurgical testwork has mainly been carried out by IHC-Robbins with some testwork also being carried out by Light Deep Earth and Core Group.

The DFS process testwork program spanned over a period of 24 months from November 2017 to November 2019. A key aim of the DFS program was to optimize and confirm the metallurgical performance of the flowsheet developed in the PFS using a representative Engebø blended ore sample (program 1364) as opposed to a high-grade and a low-grade sample as used in the PFS.The DFS Blend consisted of a more representative grade of 3.95% TiO_2 approximately reflecting the average gradefor the first 10 years of production

The DFS also included a variability program (program 1365) that aimed to understand the expected variance in the metallurgical performance by processing different ore types through an abbreviated flowsheet. The term 'abbreviated' was adopted as it refers to the reduced number of gravity processing stages in a circuit by making use of more selective processing equipment, and in the process, allow smaller samples to be processed to overcome time constraints. Results from these testwork programs indicate consistent performance, and all the samples produced market grade rutile and garnet products. The DFS financial analysis is underpinned by these two metallurgical testwork programs (program 1364 and 1365). Table 2-13 summarizes the major testwork programs conducted during the DFS and previous testwork programs used to inform the DFS.

Table 2-13: Main Testwork Programs used during the DFS

Program	Study Phase	Sample Type	Aim
1364	DFS	DFS Blend	Bulk program for process optimization and design using a DFS Blend. Results from this program was used to inform the DFS program
1365	DFS	5 different ore types	Variability program - five 150 kg samples processed using an abbreviated flowsheet
1365A		DFS Blend	Determine whether a smaller sample could replicate results obtained in program 1364
1365B		Ferro_2	Determine the performance of the developed process to a change in ore types and thus varying feed grades
1365C		Ferro_1	
1365D		Ferro_4	
1365E		Trans_2	
1663	DFS	DFS Blend	Bulk program to evaluate the process performance by replacing the tertiary HSI crusher with a cone crusher
1234	PFS	Low Grade	PFS bulk programs used to construct the TiO_2 grade-recovery relationship
1308	PFS	High-Grade	

The results from 1365A were directly correlated to the 1364 bulk program since both programs used the DFS Blend. The results obtained from the variability program were then interpreted based on this correlation.

In addition to program 1364 and 1365, a series of twenty three different optimization testwork programs were conducted with varying objectives to comprehensively understand the metallurgical response of the ore and to optimize the design of the process.

Furthermore, comminution testwork and simulations were conducted to validate the selected comminution flowsheet capable of producing a suitable and consistent feed to the process. The objective of the comminution circuit was to maximize garnet and rutile liberation while minimizing the generation of fines and overgrinding of rutile. A second bulk program (program 1663) was conducted during the DFS program to determine the impact of replacing the tertiary Horizontal Shaft Impactor (HSI) with a cone crusher (in the comminution circuit) on the performance of the developed metallurgical circuit. The results from the program supported the conclusion that the use of a cone crusher for secondary and tertiary crushing application will not affect metallurgical performance of the ore in the process.

The finalized flowsheet for the DFS retains all the process areas that were designed in the PFS phase. Optimisation work within these process areas in the DFS resulted in a more robust coarse garnet circuit, a significantly de-risked comminution circuit, and a more energy and cost efficient RUP (Rutile Upgrading Process) circuit.

The developed flowsheet will produce a single garnet product for shipment by combining the coarse garnet and fine garnet streams, and a premium grade final rutile product.

2.9.2 Flowsheet Summary

The Engebø deposit's primary constituents are garnet, pyroxene, amphibole and rutile. The mineralogical assemblage differs from typical mineral sands, however its mineralogical constituents share the same physical property differences (i.e. mineral SG, magnetic susceptibility and conductivity) as seen in minerals sands. This makes processing of the ore, using the same methodologies and equipment technologies as a minerals sand operation a viable option. Unlike mineral sands, Engebø ore is sourced from a hard-rock deposit, and as such, the ore must be crushed/milled to achieve the mineral liberation.

Comminution test work has demonstrated that a large amount of garnet can be liberated at coarser size fractions compared to rutile. This led to the development of a flowsheet processing +212µm and -212µm fractions separately. In addition to producing a coarser garnet stream, this approach is believed to reduce comminution power requirements and minimize overgrinding. A secondary grinding stage is included for the rejects from the +212µm coarse circuit to liberate the rutile and garnet in order to be recovered downstram.

The optimized flowsheet in the DFS is presented schematically in Figure 2-22.

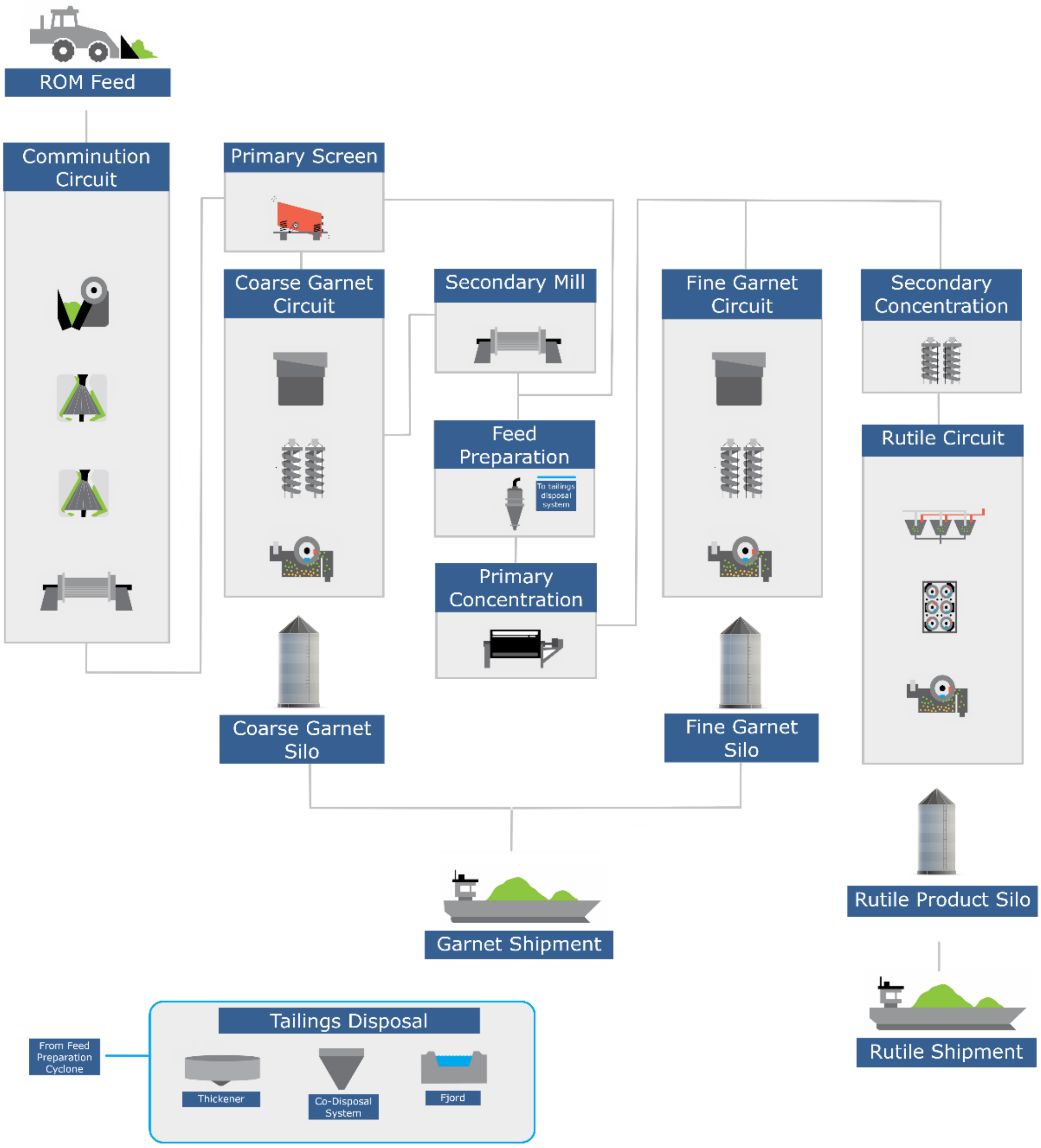

Figure 2-22: Simplified Flow Diagram of the DFS Optimized Flowsheet

1.5 Mtpa of ROM ore passes through a multi-stage comminution circuit (jaw crushing, two stage cone crushing and rod milling) and is subsequently screened to produce a coarse (-567+212 µm) and a fine (-212 µm) process feed. 37.8% of feed reports to the coarse fraction and is processed through a gravity concentration circuit and the resultant concentrate is fed to a two-stage dry magnetic separation circuit.

The final middlings from magnetic separation is screened at 212 µm, and the oversize reports as the final coarse garnet stream. Low grade tailings are rejected from the process while higher grade, unliberated tailings from the gravity and magnetic circuit are reground to -212 µm to liberate and recover additional rutile and garnet. This stream is combined with the fine process feed from the primary comminution circuit and fed to a hydrocyclone to reject the ultrafine material (-45 µm). The overflow from the cyclone reports to the thickener while the underflow reports to the Wet High Intensity Magnetic Separation (WHIMS) circuit producing a magnetic (fine garnet) and a non-magnetic (rutile) concentrate. The non-magnetic stream is fed to the rutile circuit which consists of gravity concentration followed by pyrite reverse flotation of the gravity concentrate. Dry electrostatic separation and dry magnetic separation of the flotation tailings produce a final non-magnetic and conductive rutile product. The magnetic stream from the WHIMS is fed to a gravity concentration circuit followed by dry magnetic separation to recover fine garnet. The final coarse and fine garnet streams are fed to storage silos, and blended from the silos to produce the final garnet product The thickener underflow, flotation froth, wet tailings and dry tailings are combined and fed to the co-disposal system that discharges the tailings through a pipeline to the STD.

2.9.3 Metallurgical Performance

The PFS and DFS phases involved extensive metallurgical laboratory testwork using several ore types and varying sample sizes. Of these, all large-scale bulk programs and several small-scale programs were conducted using only full scale or scaleable equipment. IHC Robbins and Hatch are of the opinion that sufficient testwork has been completed to a DFS level, and that the testwork forms a sound basis from which engineering can be completed.

In IHC Robbins' and Hatch's view, a pilot plant would be of limited value as issues with re-circulating loads, operational changes and inefficiencies for the full-scale process would remain. Hatch recommends using a mathematical model in order to simulate full scale production. Hatch performed the modelling based on Limn® which is an Excel hosted application that allows the user to draw and model the process flowsheet. Limn® iteratively solves for a solution based on the re-circulating loads and the input parameters defined in the model.

The final mass pull and recovery results were calculated using Limn®. Where available, release curves obtained from testwork were used to model the performance of the circuit. By doing so, the change in process performance to a change in feed grade (due to recirculation) can be predicted from a range as opposed to a single point obtained during testwork.

Table 2-14 presents the data used to construct the TiO_2 grade-recovery relationship. Table 2-15 shows the data used to construct the relationship between the garnet recoveries and the TiO_2 head grade.

Table 2-14: Limn® Model TiO_2 Results Comparison for different Bulk Programs

	1364	1234	1308
Head Grade			
TiO_2 %	3.95	2.73	4.89
Recoveries			
TiO_2 Recovery %	55.7	48.6	65.3

Table 2-15: Limn® Model Garnet Results Comparison for Program 1365

	1365 A	1365 B	1365 C	1365 D	1365 E
Head Grade					
Garnet %	46.6	47.5	47.0	43.8	46.4
TiO_2 %	3.84	4.73	3.53	3.28	2.77
Mass Yield					
Coarse Garnet Yield %	6.3	8.9	7.4	4.5	5.3
Fine Garnet Yield %	12.3	13.3	13.8	10.3	9.7
Overall Garnet Yield %	18.6	22.2	21.2	14.8	15.0
Ratio CGP: Overall Garnet	34%	40%	35%	30%	35%
Recoveries					
Coarse Garnet Recovery %	12.4	17.1	14.6	9.5	10.4
Fine Garnet Recovery %	24.8	26.2	27.5	22.1	19.6

The following conclusions were drawn during the DFS testwork program and subsequent Limn® modelling:

- Program 1364 was successful in producing rutile and garnet products at market grade specifications; ≥95% TiO_2 and ≥92% garnet. The PFS testwork programs were also modelled in Limn® to generate the TiO_2 grade-recovery relationship.
- The variability testwork program (1365) indicated consistent performance of the developed process for the different ore types with respect to ore feed grade and how it impacts the garnet yield. Grade-recovery relationships were established between the TiO_2 head grade and garnet yields. This relationship indicated that the TiO_2 head grade was a better predictor variable for garnet recovery using a simple linear regression model than the garnet head feed grades. The final target garnet grade was achieved for 1365A to 1365E.
- Program 1663 indicated consistent mass splits compared to program 1364 and achieved the market-grade rutile and garnet products. The program results supported the conclusion that using a cone crushing technology for tertiary crushing will result in similar metallurgical performance as the HSI.

2.9.4 Plant Description

The engineering design of the process plant and associated plant infrastructure for the DFS was completed by external consultants appointed by Nordic Mining, including Hatch, Asplan Viak and COWI. Key inputs into the engineering design included:

- Norwegian legislation
- Project specific permits and plans, including zoning plans and the project Environmental Permit
- Discipline specific design criteria and project specifications
- Process Flow Diagrams (PFDs), Stream Tables and Process Design Criteria
- Specific technical studies, investigations and testwork by sub-consultants to support the engineering design.

At the commencement of the DFS a trade-off study was undertaken to assess a modular design strategy for the process plant, as opposed to a stick build approach. A decision was made to follow a modular design strategy. The bulk of the process plant will be fabricated and assembled off-site at a large modular yard. Each module will be partially pe-commissioned at the module yard before shipment to site. Key considerations for the modular design, construction, sea transport and site installation have been incorporated into the engineering design, plant layout and construction schedule.

No new untested equipment is used in the process flowsheet. All equipment is standard industry equipment.

Mechanical equipment sizing and quantities were developed from the process design, which formed the basis for the equipment technical specifications that were issued to the market for pricing of the mechanical equipment. The preliminary mechanical equipment load list formed the basis for the Electrical design and was used to develop the technical scope for the electrical equipment supply packages.

Piping and Instrumentation Diagrams (P&IDs) were developed from the PFDs and the Control Philosophy, which provided the basis for the process plant Piping and Control and Instrumentation discipline design work.

Mechanical equipment sizing based on potential supplier's equipment was used in the model development, with platework, chutes, bins and sumps modelled as well. The process plant design has been developed in the DFS into 15 discrete modules and nine product storage bins, for off-site fabrication. Each area was modelled to a Milestone 1 status (layout freeze), which formed the basis for Structural and Piping Discipline modelling. All disciplines developed Bills of Quantities from the plant layout and module designs, which formed the basis for pricing for the major site contracts.

Civil designs have been based on the structural design loads and mechanical layout requirements, with roads and access designed for module transport during construction, as well as process plant operating and maintenance requirements.

2.10 Project Facilities

2.10.1 General Infrastructure

- **Power and Water supply infrastructure**: Bulk power for the Project will be supplied by SFE, the regional power supply company. The existing 22 kV grid from Øyravatnet transformer station to Engebø will be upgraded. A new 22 kV feed from the Øyravatnet substation at Skorven to the Engebø site will also be installed. A subsea power line will be routed to the northern side of the fjord, from where it will be routed (buried cable) to the Engebø site. The two SFE lines will feed into a Main SFE Intake Substation located within the process plant. Nordic Mining has requested 13MW power supply from SFE. The current plant power budget is within this limit.

- **Water Supply:** Bulk raw water supply for the Project will be sourced from the Skorven hydropower plant, situated at the southern side of the Fjord. A new pump station will be constructed at the power station, from where the 9.4 km long pipeline will be run across the Fjord to the northern bank, and then routed to the site in a trench. The new SFE 22 kV power line will follow the same route, and the power line will be in the same trench on land as for the water pipeline. A redundant water line will be installed for the undersea fjord crossing section, while on land only a single pipeline will be provided. The water pipeline will discharge into a 1,500 m^3 water reservoir, located at an elevation of 87 m AMSL. This reservoir will provide 12 hours raw water storage capacity for the process plant.

- **Relocation of Fv611 Regional Road**: The existing Fv611 road must be relocated for a length of 900 m to provide sufficient area for the process plant. This work will be prioritised in the construction phase to open up the entire process plant area for construction activities.

- **Site Communications:** External communications from site will be via fibre, or a 5G network, if available.

- **Open pit mine infrastructure**: The open pit mine facility will be fenced with a 2.3 m high wildlife fence. Power supply will be routed into the mine area for pit dewatering pumps, and other requirements. Provision has been made for pit dewatering, which will be facilitated by means of a floating pontoon housing two submersible dewatering pumps, located in a mining sump area. The pumps will discharge pit water to a vertical drain hole, located adjacent to the mining vertical ore pass. This water will be routed by pipeline from the underground area to crusher chamber to one of two settlement ponds located in the process plant area, for final settlement of suspended solids before release into the Fjord.

- **Haul Road:** A new haul road will be constructed from the open pit mining area to the mine service area. Access off from the haul road to the waste rock and low grade material stockpile area will be provided.

- **Mine Service Area**: The mine service area will consist of an Earth Moving Vehicle (EMV) service workshop. The building design will allow for potential future expansion. A fuel and lubricants storage facility will be provided. Haul trucks will be able to refuel at this facility. The EMV fleet permanently located in the open pit area will be refueled by a fuel truck. A 55 m^3 fuel storage tank will be provided, for diesel and Adblue storage and dispensing. The service area will also be provided with open parking areas for the mine fleet, a brake test ramp, as well as utilities for the EMV workshop.

- **Waste Stockpile Area Water Management**: A suitably sized sedimentation pond shall be provided in the overburden storage area. Water run-off from the waste rock and low grade stockpile areas will be channeled to the pond by means of temporary berms and channels, which will be progressively modified by mining operations as the footprint of the stockpiles extends. The pond shall allow for the settlement of suspended material. Water discharge from the pond to the fjord will be by a drainage channel.

- **Access Road**: An access road will be constructed to connect the relocated Fv611 and the mine service area. This road will be mainly be used for personnel movement, as well as the supply and movement of fuel, spares and other activities in support of the mining operation. It has been designed with a maximum gradient of 1:10.

- **General Surface Runoff**: The design of all new roads and structures will include drainage structures for the management of general surface run-off water.

- **Underground Facilities**: Underground excavations, silos and tunnels to support the primary crushing, storage, and retrieval of ROM material will be constructed. From the vertical ore pass, material will be extracted by apron feeder to a primary jaw crusher, from where the material will be conveyed and discharged into one of two 20,000 t capacity silos. The withdrawal of ROM material from the two silos will be by means of apron feeders, and material will then be transferred by conveyor along a tunnel, before crossing the relocated Fv611 road and discharging into the secondary crusher module in the process plant. When the mining operations transfer from open pit to underground mining, additional underground infrastructure will be required.

- **Underground Ventilation**: An underground ventilation system to service the underground tunnels and chambers will be installed to ensure the constant flow of clean air through the working areas.

- **Underground Dewatering**: Provision has been made for three sumps in the main underground working areas, where maximum water ingress is expected from the vertical ore pass and silos. Floor sloping and drainage channels will drain water to the sumps. Submersible spillage pumps, connected to a common discharge pipeline, will be used for the pumping of water from these sumps to the process plant settlement ponds.

- **Process Plant Facilities**: The process plant site facilities include water reticulation for raw water, potable water, fire water and process water, an LPG gas storage facility; compressed air systems; dust and off-gas handling systems; sewage treatment facility, fire protection and HVAC (Heating, Ventilation and Air Conditioning) systems, boundary fencing around the site, and an existing quay.

- **Plant Water**: The water systems that are required to support the site operations include:
  - Raw water reticulation, from the main raw water reservoir.
  - Potable water for the process plant area and mining service area. A potable water treatment plant is provided.
  - Fire water reticulation for the process plant and mining service area.
  - Process water storage and reticulation (for all recycled plant water, to minimize raw water demand).
- **Buffer Stockpiling Facilities**: There is provision for four buffer stockpiles at various points in the process stream. The stockpiles are located to the east of the plant and will be housed in open sided covered structures. The stockpiles will be reclaimed by Front-End Loaders (FEL), which will feed respective re-slurrying hoppers for the material to be pumped back into the process.
- **Product Storage and Loading Facilities**: The final product storage consists of 9 final product bins. The bins will discharge onto a discharge conveyor and final product shiploader. The bins have been sized in accordance with the current Project shipping volumes and frequencies.
- **Tailings Disposal Facilities:** A tailings disposal system, designed by COWI, shall be used for the transfer of tailings from the process plant for controlled deposition in a dedicated area at the seabed. The tailings system comprises a mixing chamber and subsea discharge pipeline, for hydraulic discharge of the tailings at a depth of 250 m, approximately 50 m above the seabed.
- **Plant Gas:** Liquefied Petroleum Gas (LPG) is used in the process plant, for the drying of rutile and garnet bearing material. Provision has been made for a LPG gas storage facility in the process plant. LPG for the Project will be supplied by a local gas supplier. Gas will be transported in by road via a standard 18 m SEMI truck.
- **Compressed Air Systems:** Plant and instrument air is supplied by a centralized compressor plant located in the process plant at the +23 m terrace level between the wet and dry process circuits. The compressor system consists of two compressors (one running, one standby), and two 1 m^3 air receivers. Plant air is fed directly from the receiver, whilst instrument air is dried using a desiccant dryer.
- **Process Plant Buildings, Workshops, laboratory and Stores:** The administration building, change house, control room and laboratory have been combined into a multi storey building. Provision has been made for an 840 m^2 combined plant workshop and stores building located in the north of the process plant, with direct road access to plant main entrance road to facilitate ease of access for loading and off-loading of goods and equipment.
- **Sewage Treatment Plant**: The sewage treatment plant has been sized for the operational staffing requirements. The system is gravity driven and the plant consists of an underground sludge separator.

- **Process Plant Spillage Control**: All process plant areas will be bunded, to contain any local spillage of material or wash down water. Sumps complete with sump pumps shall be used to collect and transfer any spillage water.

2.11 Environmental and Social Responsibility

The environmental and social standards applicable to Norway forms the basis for the Engebø Project. Norway is a member of The European Economic Area (EEA) and policies and regulations are compliant with those of The European Commission. EU regulations such as the Water Framework Directive (WFD), REACH (regulations for use of chemicals) and the Mining Waste Directive are implemented in Norwegian environmental legislation.

Nordic Mining will develope the Engebø Project in accordance with relevant Equator Principles and IFC's Performance Standards and Guidelines to ensure that high international standards are met.

2.11.1 Environmental and Social Impact Assessment

Extensive ESIA studies were carried out as part of the permitting process. ESIA reports can broadly be divided into groups:

- The zoning plan and environmental permit ESIA documents, years 2008-2012
- Additional ESIA documents as requested by the Ministry of Climate and Environment, year 2012-2014
- The zoning plan for water pipeline for fresh water, year 2018 (some preliminary studies in 2012)
- The detailed zoning plan, year 2018-2019.

Table 2-16 gives an overview of subjects covered in different ESIA studies.

Table 2-16: Overview of Main Topics in ESIA Studies

Report Topics	Numbers of Studies	Scope
Geochemistry of ore and waste, and impact of chemical additives	4	Test work and modelling of environmental impact
Terrestrial habitats	5	Baseline studies and impact modelling
Fresh water, wells, streams and rivers	4	Baseline studies for water quality and biology, and impact modelling
Marine hydrography	2	Baseline studies for water quality, hydrology, currents in the Førde Fjord
Marine biology	5	Baseline studies for benthic fauna, fish, corals
Fish farms and fisheries	3	Impact assessment on fish farms and fisheries in the area adjacent to the STD
Marine tailings impact modelling	6	Modelling of tailings dispersion and accumulation and potential impact
Cultural heritage, terrestrial and marine	5	Baseline studies and assessments of effects
Air quality	1	Modelling of potential effects
Noise and vibrations	5	Evaluation of blasting patterns and modelling of potential effects from noise and vibrations both on land and in the sea
Terrestrial landscape impact assessment	2	Baseline studies and modelling of visual effects
Other	25	Studies include alternatives considered, ballast water, land slide risk

In total 67 environmental and social reports have been produced. Norwegian authorities regarded the ESIA studies satisfacory for assessing the environmental and social risk of the Project.

2.11.2 Social and Economic Effects

The ESIA concludes that the Engebø Project will have significant positive social and economic effects in the region due to direct and indirect employment and tax revenues. The Project will employ 105 people that will substantially contribute to local employment. The Project will have a positive impact on local settlement and may lead to reversing of an historical commuting and migrating workforce trend.

The project is expected to have substantial indirect effects for a variety of supporting business and services, both locally, regionally and nationally. A study (SINTEF 2013) estimated that the Project will have an employment ripple effect factor of 1.9, which means that with 105 direct employees, the total number of indirect jobs generated will be approximately 200.

Sunnfjord municipality will receive increased tax revenue through income, wealth and property tax related to the Project. A 22% corporate tax for the enterprise will be received directly by the State. The increased revenues are assessed to have a large positive effect, in particular for the municipality of Sunnfjord.

The Engebø Project will be a long term corner-stone operation in the region. The Project will as far as possible seek to employ locally and regionally, and will promote educational programs to secure adequate competencies. A locally based work force, settling and living in the region, is considered a strategic advantage contributing to a safe and healthy working environment.

2.11.3 Terrestrial Impact

The region surrounding the Project Area is to a large extent pristine with natural habitats and some agricultural activity. There is minimal industrial activity in the region. The Project area has, as part of the ESIA process, been mapped in terms of land use, landscape qualities, natural habitats, endangered species and wildlife. Some key features of the terrestrial landscape are:

- A habitat of conservation importance with rich deciduous woodland is found on the southern slope of the Engebø hill and one red listed orchid species has been documented in this area.
- There is limited wildlife at Engebø, but several species of birds have habitats in the forests surrounding the mountain.
- Traces of deer activity such as grazing and tracks have been documented in the Project area. The area is however not regarded to be of substantial importance for the regional deer population.
- There is limited agricultural activity at Engebø, but there is some pasture of sheep, cows and horses, rented out by landowners to local farmers. There is also some recreational use for hiking by the local population.

Based on the ESIA studies, measures incorporated into the DFS design to limit the effects on the landscape, natural habitats and visual impact include:

- The open pit is restricted to an area on top of the Engebø hill to limit the visual impact and disturbance of natural habitats. The profile of the hill will largely be preserved when viewed from nearby areas.
- A park belt around the industrial operation will be preserved as habitats for wild life, and will provide visual screening for the operation to the surroundings in the form of trees and vegetation.
- Revegetation of the waste rock storage area and the visible open pit benches will be carried out.
- The open pit, waste rock storage area, process plant and sections of the access road will be fenced in to keep people and wild life from entering the operational areas.
- Parts of the access road will be placed in a tunnel to reduce visual disturbance, noise and dust.

2.11.4 Impact on Fresh Water

Ground water quality in the Project area is generally good and is a source of drinking water in small wells for local farms. There is limited surface water at Engebø. As a result of the lack of major streams or rivers, flood line determination does not apply and no river diversions will be required.

The Engebø ore and waste rock has no acid producing capability and low heavy metal content. The risk of heavy metal or acid contamination of nearby streams, ground water is regarded as low. However, particulate matter (suspended solids) and remnants of blasting chemicals escaping from the waste rock deposit and the open pit can pose a potential source of pollution. A sedimentation pond will be constructed at the foot of the waste rock pile to confine drainage water and allow sediment to settle, in order to limit potential negative effects. Excess water from the pond with reduced sediment load is diverted to the process plant and ultimately discharged to the sea. A second sedimentation pond will be constructed at the process plant area for drainage water from the open pit.

2.11.5 Marine Impact

The Førde Fjord is a typical glacial fjord, 40 km long, with steep slopes and a flat deep fjord basin. The fjord is up to 330 m deep and is characterized as a sedimentation environment. Millions of cubic meters of sediments have accumulated from glaciers, rivers and erosion of surrounding landmass on the seabed consisting of clay and silt.

The Sea Tailings Deposit (STD) area comprises maximum 5% of the total fjord bottom and is located at approximately 300 m depth. In combination, the zoning plan and environmental permit, forms a 3 dimensional volume that regulates the particles dispersion and accumulation from the STD. Particle concentration and sedimentation outside the regulated area cannot exceed permitted levels (at non-effect concentrations). The environmental permit also states that particles cannot exceed the permitted thresholds 40 m above the discharge point which means that the water column above the discharge point to a large extent is unaffected. Figure 2-23 shows the area permitted for tailings and the footprint of the STD at end of the Project lifetime (inner circle).

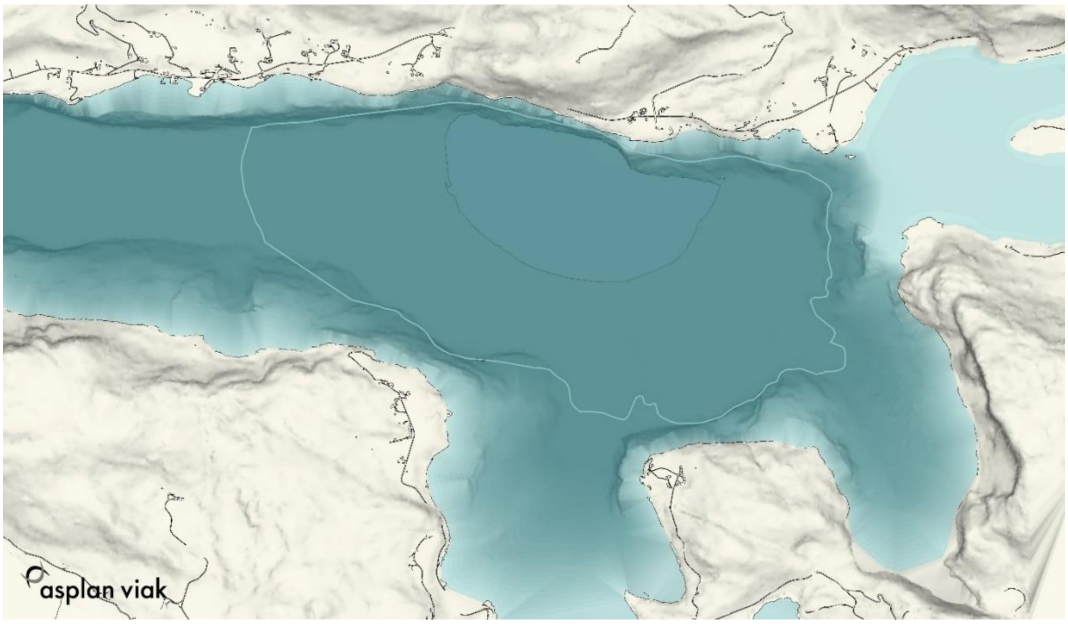

Figure 2-23: Overview of the Sea Tailings Deposit area

Some sensitive features of the Fjord identified in ESIA studies are:

- Atlantic Salmon migrating through the fjord adjacent to the Project site and in the vicinity of the STD.
- Deepwater red-listed fish such as blue ling, common redfish and spiny dogfish have been documented in the Fjord area.
- The coastal cod spawns in several shallow areas in the Førde Fjord.
- The nearest aquaculture facility is approx. 1.8 km from the border of the regulated STD.
- There is limited commercial fishing in the fjord, but some recreational fishing.

Main conclusions from the ESIA regarding potential effect of STD:

- Engebø tailings is regarded as inert minerals with low risk for heavy metal pollution to the Fjord. The composition is similar to the natural sediments found on the bottom of the Fjord.
- There is little risk for particles spreading in significant concentrations outside the STD area and to shallower water depths beyond 100 m depth.
- The tailings will mainly affect bottom living organisms (benthic fauna) within the regulated area where the sedimentation rate is high. The effect on the benthic fauna will be significant in the deposition area. Mobile species such as fish will likely avoid areas with high turbidity (sediment concentration).
- The tailings deposits pose low risk to the cod that have their breeding grounds outside the STD in shallow fjord areas.

- The STD poses low risk of serious harm to endangered deep water fish, such as the spiny dog fish and blue ling, since the STD constitute a small part of their habitat.
- There is low risk for effects on commercial and recreational fishing in the fjord outside the designated deposit area.
- There is low risk for effects on fish farms since these are operated outside the designated area and in shallow water.
- There is low risk for effects on migrating salmon since salmon generally remain within the upper 30 meters of the fjord water column that is unaffected by the STD.
- The benthic community is expected to return to a good state within 10 years after deposition ends, but potentially with a different species composition reflecting the new sea floor environment.
- The effect of the STD is local and there is little probability of serious or irreversible effects on the fjord's ecosystem.

Limiting the effects of the STD is largely linked to minimizing the risk of particle dispersion exceeding the regulated area and permitted thresholds. Advanced modelling shows that the particle dispersion and sedimentation is predicted to be largely within the permitted area. The modelling was based on assumptions of 4 Mtpa of tailings deposited and a total of 250 Mt over the Project lifetime. The current DFS plan is to deposit 1.2 Mtpa and 49 Mt in total. This is a reduction of 80%. With the overall smaller footprint of the tailings deposit the risk of unforeseen particle dispersion outside the permitted area is regarded to be low.

Project design measures to accommodate environmental permit restrictions related to the STD include:

- Fresh water is removed and tailings is conditioned with seawater to increase the density of the STD plume and minimize the risk of updrift and increase sedimentation
- The STD system will be deaerated to avoid air bubbles entering the system and causing updrift
- The STD system will be flexible to ensure that optimal positioning of the tailings pipe can be obtained, with possible movement both in the horizontal and vertical plan
- Flocculation agent Magnafloc 5250 will increase flocculation effects to form dense flocs of particles for more rapid settling. This is in addition to the natural flocculation that is proved to be an important factor in sea water
- Advanced monitoring systems will be put in place to continually control the deposition process so that additional management measures can be taken if potential non-conformances are identified.

2.11.6 *Cultural Heritage*

Archaeological mapping and assessments have been carried out in accordance with the Cultural Heritage Act §9 (9 June 1978) for the Project area. Five sites with traces of prehistoric settlement and activities were documented. The five sites have been excavated, and the sites are released for industrial development. There are no further liabilities in terms of archaeological investigations or excavations in the industrial area prior to construction.

2.11.7 *Stakeholder Engagement*

Stakeholder engagement is an integral part of the Norwegian permitting process for establishing new industrial activity. All permit applications and ESIA studies are made publicly available and are subject to a consultation/hearing process where stakeholders can state their views. Nordic Mining acknowledges the importance of actively engaging with stakeholders in order to develop and maintain sustaining relations with communities and other parties affected by the Project. Nordic Mining's goal is to continue and strengthen these relations in the construction and operational phases, and throughout the Project life. The belief of the Company is that a strong stakeholder engagement is of long term strategic importance for reducing social risk, attract employment, identify new business opportunities and obtaining a social "license" to operate.

There has been substantial interest and engagement from stakeholders in all hearings. Each process has generated in the order of 20 to 30 input letters from different stakeholder groups. In the hearing rounds, the main concerns of the stakeholders have been related to the STD.

In addition to the formally organized stakeholder engagement, Nordic Mining has actively engaged with stakeholders throughout the Project development. This includes numerous public meetings held in Naustdal and Askvoll municipalities with invitations for stakeholder participation. Typically, meetings have been initiated when the Company has submitted new applications, published results from environmental studies or planned physical work on site, such as the drilling programs. Meetings have been announced in local newspaper and on posters in local stores. Attendance at the meetings has been good with 50 to 100 attendees, including municipality representatives, NGOs and local media.

For future engagement with stakeholders, Nordic Mining will develop a documented Stakeholder Engagement Plan (SEP). The purpose of the plan is to describe the Company's strategy and program for engaging with stakeholders. The goal is to ensure timely provision of relevant and understandable information and create a process that provides opportunities for stakeholders to express their views and concerns, and allows the Company to consider and respond to them. The SEP will be aligned with the IFC's stakeholder engagement handbook.

Nordic Mining will establish a Resource Group to assist and strengthen stakeholder dialogues during the construction and operational phases. Resource groups have been used with success in other mining companies in Norway to facilitate community based monitoring. This approach has proved to create a good environment for ongoing stakeholder engagement and building trust with the company. The purpose of the Resource Group is for stakeholders to have a forum for sharing information and engaging with the Company. The focus of the group should be engagement in the monitoring program for assessing environmental effects of the operations and specifically the tailings deposit. Representatives from key stakeholder groups will be invited to participate and the results from monitoring programs will be presented and discussed. A third party consultant will participate as an independent expert to increase confidence in the impartiality of the dialogue.

2.11.8 Environmental and Social Management

Nordic Mining will develop an environmental and social management system (ESMS) to ensure environmental and social issues are managed in accordance with the company's standards, permits and Norwegian regulations. Nordic Mining aims to develop the system and supporting programs prior to construction and adapt the system for operation as part of the operational readiness work. The objectives of the ESMS will be to

- Undertake the ongoing identification and assessment of potential environmental and social impacts, both adverse and beneficial, building on the ESIA and its supporting studies
- Avoid, or where avoidance is not possible, minimize, mitigate or compensate for adverse impacts and enhance positive impacts on workers, affected communities, and the environment
- Seek to continually improve operational performance by means of adaptive management
- Ensure affected communities and staff are engaged on issues that could potentially affect them
- Confirm compliance with regulatory and corporate requirements
- Confirm compliance with IFC standards and Equator Principles and lenders commitments.

The table below highlights some of the key management planning and programs identified as being required and the status of development of these. Some of these require regulatory approval prior to commissioning, in accordance with the requirements of the zoning or environmental permits.

Table 2-17: Key Plans and Programs Supporting of ESMS

Management Plans and Programmes	Approval Authority	Status of Development
Environmental monitoring program	Environment Agency	Framework approved. Detailed program for salmon migration submitted in Q4 2019. Additional programs to be submitted Q1 2020.
Measurement program	Environment Agency	Will be developed in collaboration with DNV GL starting Q4 2020.
Energy leadership program	Environment Agency	Planned developed by Q4 2020
Environmental risk and preparedness assessment for acute pollution	Environment Agency	Planned developed prior to construction commence, Q4 2020
Extractive waste management plan	Environment Agency	Will be developed prior to construction
Industrial and domestic waste management plan	Environment Agency	Will cover waste minimisation, separation, recycling/reuse and disposal
Financial costing for closure, rehabilitation and monitoring of waste deposits	Environment Agency	Preliminary estimates are included in the DFS financial analysis. Further assessments will be carried out later
Plan for blasting	Environment Agency	Planned developed prior to construction commence, Q4 2020
Optimal positioning for tailings discharge	Environment Agency	An assessment is initiated and will be carried out by SINTEF and finalized Q1 2020
Program to assess long term effect of process chemicals	Environment Agency	Assessments are ongoing. Studies to be finished Q1 2020
Noise zone map	Environment Agency	Planned developed prior to construction, Q4 2020
Internal control system	Environment Agency	Framework provided here but will require formalising as part of the system documentation
Emergency prevention and response plan	Voluntary	Emergency prevention and response plan in relation to acute pollution is required by the Environment Agency. A plan will be developed prior to operation
Monitoring program	Sunnfjord municipality	This is a required by zoning plan regulations. There will be overlap with Environmental Monitoring program required by the Environment Agency. The program will be developed prior to construction
Report on current state of buildings and infrastructure surrounding the mine and plan for measures related to blasting	Sunnfjord and Askvoll municipality	The program is planned developed before construction commence
Stakeholder engagement plan	Voluntary	Some documentation of stakeholders started. Plan to be developed before construction commence.
Construction environmental management plan (CEMP)	Voluntary	Will be developed in FEED phase – will cover general environmental management during construction including land clearance, water and waste management and dust controls

Management Plans and Programmes	Approval Authority	Status of Development
Operational environmental management plan (OEMP)	Voluntary	Building on the lessons learnt during construction, the OEMP will cover general environmental management during operation including land clearance, water and waste management and dust controls
Closure Plan	Voluntary	A high level plan for closure after 5 years of operation was made for the application of the operational license. The plan will be detailed and expanded to LOM before operation starts

2.11.9 *Closure Planning and Costing*

The closure of the operation can broadly be divided into five different areas: the open pit and service area, underground mine and infrastructure, the waste rock area, the process plant and the STD. As part of the operational readiness work, Nordic Mining will develop a closure plan that will contain a description of the different aspects of the closure and related cost. The plan will be subject to reviews on a regular basis to ensure the plan's adherence to operational plans. Stakeholder review and input will be part of the reviewing process. Nordic Mining has some formal requirements for closure and rehabilitation stated in the zoning plan, environmental permit and the operational license (application, not yet granted) which have been included in the Project financials. This includes:

- Rehabilitation and revegetation of pit benches and waste rock deposit
- Cleaning and removal of equipment at Project site
- Capping and closure of underground infrastructure and ore passes
- Continued environmental monitoring of tailings deposit and waste rock facility for 15 years after closure
- Removal of buildings at work shop in the service area
- Fencing and maintenance of fence around the open pit.

2.12 Project Execution Plan

The key Project execution objectives are:

- Deliver the Project within the schedule, budget and performance requirements set for the Project
- Implement and maintain the highest health and safety standards for the Project
- Compliance with all environmental regulations and requirements set for the Project
- Develop and foster community and social engagement during the Project execution
- Implement the operational readiness strategy to support the successful ramp up and operation of the plant
- Establish an operation that is a significant global player in the rutile and garnet markets, and an employer of choice in Norway.

The Project strategy for the design, procurement, construction and commissioning of the plant is based on the following approach:

- **Stage 1**: Critical path engineering work will be progressed in the Front-End Engineering and Design (FEED) Phase, which is the period between completion of the DFS and Project approval. This period will also be used for process design finalization, critical path engineering development, and commercial engagement with the market for critical equipment and finalization of early works contracts, as well as Project execution set-up and detailed planning
- **Stage 2**: Once Project approval has been received from the Nordic Mining Board of Directors, the balance of engineering and procurement activities will be executed. The EPCM contractor will mobilize to site shortly after Project approval to manage the early works site activities. The EPCM construction management team will remain on site to oversee all construction related activities. An EPCM commissioning team will be mobilized to site at the conclusion of construction to facilitate the commissioning activities.

The design of the Project is based on a modular approach, based on a trade-off and Project decision made at the commencement of the DFS. The process plant design (excluding underground equipment and other specific facilities) is incorporated into 15 modules and a set of 9 final product storage silos. The maximum individual module design envelope is 36 m high x 18 m wide x 54 m long. Modules will be assembled to the maximum extent in the module yards, complete with mechanical equipment, piping, instrumentation and electrical systems fully installed.

Modules will be transported to site in batches using specialist module shipping contractors. On delivery to site, the module shipping contractor will use multi-wheeled SPMT (Self Propelled Mobile Transporters) to offload the modules at the jetty, and transport the modules along specially design ramp roads for placement onto prepared foundations. After delivery to site, engineering interconnections between modules will be completed, as well as connections to other site utilities and process equipment.

2.12.1 Procurement and Contracting Strategy

The Project will be executed using a combination of on-site and off-site construction contractors, as well as equipment suppliers for the supply of mining, processing, utility and general equipment.

Equipment will be sourced from approximately 60 global equipment suppliers. In the DFS, enquiries were issued to the market for most of the equipment. Known international suppliers were approached to tender in this phase. Shortlisted suppliers will be re-engaged in the next phase with final, approved specifications, for adjudication and order placement. No unique, untested equipment will be utilized on the plant.

The construction of the Project is based on the appointment of six major construction contractors, as well as several smaller site contractors.

2.12.2 Project Organization

Nordic Mining will have a dedicated Project Construcion team to support the Project execution. The team will be led by the Nordic Mining Project Director, reporting to the Project Steering Committee. A Location Manager will have the Administrative Responsibility of the owners team. Initial operations team will be progressively strengthened with new appointments, in line with the Operational Readiness strategy.

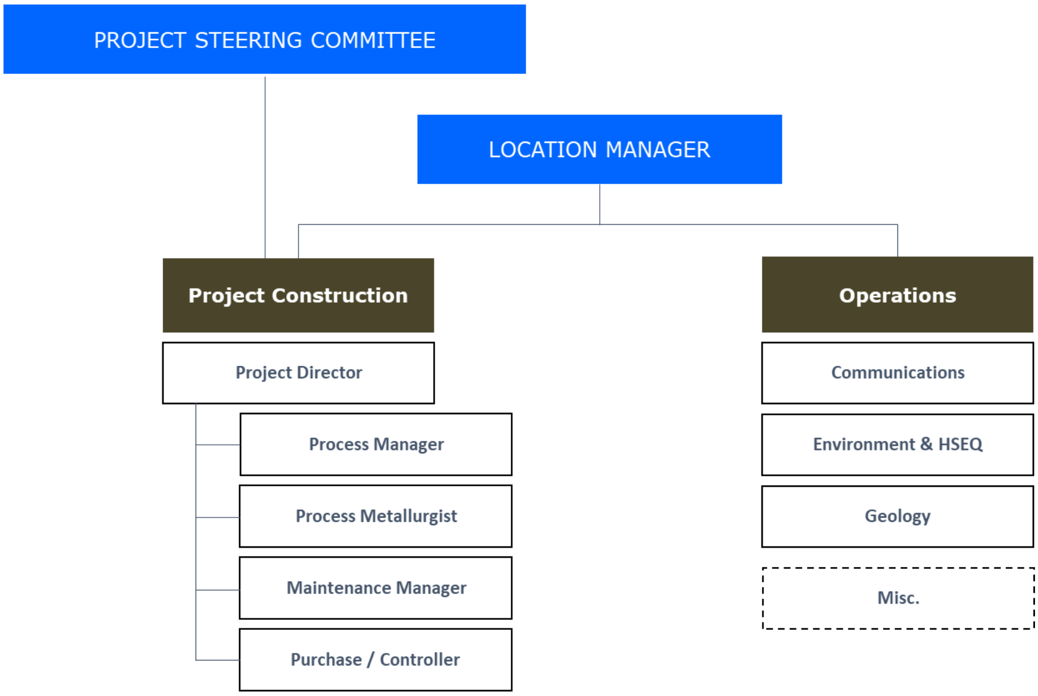

Figure 2-24: Preliminary Owner's Team

The EPCM project team structure will be based on a traditional EPCM model. The preliminary integrated project construction team is illustrated in Appendix 1 below. Three main locations are envisaged:

- Home office project management, engineering and procurement
- Module yard EPCM construction management
- Engebø site construction management.

The core functions to be performed at each location include:

- **Home office project management and controls, engineering and procurement**: A multi-disciplined engineering team shall be responsible for the detail design of the plant. The design shall be compliant to Norwegian and project standards and specifications. The engineering team shall support the procurement team with the development of equipment and contract related technical documentation; technical adjudication of tenders; and review and approval of contractor and vendor data after award. Core engineering staff will continue the Project to assist with site related queries, and where required, commissioning support. The Procurement team shall manage all commercial engagements with the market for tendering, clarification, adjudication, final negotiation and award of contracts and purchase orders.

The team shall manage all contracts and orders after award, until close-out. Contracts administration of site contracts shall be transferred to site-based contracts administrators, forming part of the EPCM construction management team, on mobilization of the contractors to site. Logistics coordination and expediting of information and equipment from suppliers will form part of the procurement activities. Overall management of the EPCM scope shall be the responsibility of the EPCM Construction Manager. The Project Manager will report to the Nordic Mining Project Director, and internally to the EPCM company corporate governance structures. The Project Manager shall be supported by a Project controls team for the management and control of Project cost and schedule, and regular reporting to the Project stakeholders. Other home office functions will include Health and Safety Management and Quality Management, to support home office and site related activities. The EPCM will set up and manage the flow of Project documentation internally and to suppliers, contractors and the Client through a document management system, to ensure that all parties have the latest revisions of documentation at their disposal. Risk management, including HAZOP studies, will be conducted by the EPCM.

- **Module yard EPCM construction management:** A small team will be based at the module yard to manage the construction activities associated with the modular contract. The team will include a Module Yard construction Manager, discipline supervisors, quality manager and contracts manager. This team will be based at the module yard facility, and offices will be provided by the module yard for the EPCM team.
- **Engebø site construction management:** The EPCM construction management team will be established on site to support the arrival of the first site early works contractor. The EPCM team will, where required, be expanded when additional site contractors are mobilized. The EPCM team will be managed by a site construction manager. Key EPCM functions will include site technical supervisors, health and safety management, quality management, planning, and contracts administration. At peak, it is envisaged that the EPCM team on site will be fifteen people. Temporary EPCM site offices will be required for the EPCM team on site. These offices may be shared with the Nordic Mining site personnel, and additional seating will be provided for any visiting consultants, equipment supplier technical representatives or Project management personnel. It is not envisaged that the Project will provide site accommodation for the site contractors. In the DFS, contractors indicated that they will provide their own accommodation. It is also envisaged that the EPCM team will rent accommodation in local towns, close to the site.

2.12.3 Environmental and Social Management

The EPCM contractor will develop a Construction Environmental Management Plan (CEMP). The CEMP will consolidate the various applicable Norwegian environmental and social standards into one document.

2.12.4 Commissioning

Commissioning activities for the Project will be done at both the module yard and Engebø site. Commissioning will be executed in accordance with the project commissioning plan.

The EPCM commissioning manager shall set up and develop required commissioning systems, plans and procedures.

At the module yard, an EPCM commissioning team be responsible for pre-commissioning of the modules to the maximum extent possible before shipment to site. This shall typically include I/O checks, loop checks, bumping and direction testing of motors, and vibration testing.

At the Engebø site, the EPCM commissioning team shall be responsible for other pre-commissioning activities not completed in the module yard, as well as cold commissioning and system integration, which includes testing of process and device interlocks and water testing (where feasible). Commissioning activities may require the support of specific critical equipment suppliers, a core team of technical staff from the construction contractors (for equipment or plant adjustments), as well as Owner's team staff.

On completion of cold commissioning, the project will proceed with Hot Commissioning and Ramp-up.

2.12.5 Operational Readiness

In the DFS, Operational Readiness planning was preliminary developed through various meetings, discussions and workshops. The operational design for Nordic Mining has been based on a lean staff count, high degree of automation and optimal use of digital technology to support managerial, operational and maintenance work functions.

An Operational Readiness Strategy document has been developed to provide the framework for operational readiness work in the next phase.

Nordic Mining plans to have all management, operational and maintenance functions performed by permanent staff. For the initial start-up period, the plan is to use a contract miner for operational mining, including maintenance of the contractor-supplied mining fleet. Current planning indicates a total operational head count of 105 people, including the mining contractor.

Nordic Mining will use the services of either the EPCM contractor or similar third-party specialist, to assist with Operational Readiness implementation during the construction phase leading to steady state labour as can be seen in Table 2-18

Table 2-18: Steady-State Labour Complement

Summary	Head Count
Management and Administration	14
Technical Services	4
Mining	31
Comminution and Process	38
Laboratory	7
Maintenance	11
Total	**105**

2.12.6 Project Schedule

The project schedule has been developed utilizing a bottom-up estimation technique along with the Critical Path scheduling method (CPM). A work packaging methodology has been applied throughout to the schedule to ensure that all activities are packaged into practicable work packages that support accurate progress measurement, accountability and responsibility. The schedule has been developed to a Level 4 detail and Class 2 accuracy level.

The schedule has undergone multiple rigour reviews with the project team to ensure that the durations and sequence is optimal and precise. The schedule outcome is summarized in Table 2-19:

Table 2-19: Project Schedule

Activity	Start Date	Finish Date
FEED	March 2020	December 2020
Construction	January 2021	September 2022
Cold Commissioning	July 2022	October 2022
Hot Commissioning and Ramp Up	October 2022	September 2023

2.13 Capital and Operating Costs

2.13.1 Capital Cost Estimate

An AACE(I) Class 2 Capital Cost Estimate was developed for the Project.

Key inputs into the Capital Cost Estimate included:

- Equipment supply and construction contract pricing were predominantly based on a competitive bidding and adjudication process. Equipment sizing and bulk quantities were derived from the engineering design.
- Estimates were also obtained from other project consultants/contributors and incorporated into the overall project estimate.
- Growth allowances were applied to allow for quantitative engineering design development relative to the level of engineering completed in this phase.
- Estimates for Owner's costs, EPCM costs, and other indirect costs were developed based on estimations of activities, resources and deliverables.
- Contingency was determined in a Quantitative Risk Assessment (QRA).

The capital cost estimate to establish the open pit mining operation and the process plant is USD 311 million, as summarized in Table 2-20.

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Table 2-20: Capital Cost Estimate

Capital Cost Estimate	USD million
Open pit mining and comminution	58.788
Mineral processing and tailings handling	77.722
Infrastructure, storage and loadout	103.206
Indirects (excluding contingency)	50.315
Contingency	20.673
Total	**310.705**

The estimated cost of establishing the underground mine is USD 25 million (in current money terms) which is included in the financial analysis.

The contingency allowances in the above capital cost estimate has been calculated by a QRA to determine the Project's capital risk profile. Contingency at a statistical mean confidence level has been allowed for, equating to 7.13% of the capital cost estimate excl. contingency. The accuracy of the capital estimate is -15% to +16%.

More details from the QRA can be found in the Risks and Opportunities section; Section 2.16.

2.13.2 Operating Cost Estimate

The operating cost estimates for all key operating cost drivers were developed from first principals. Costs for consumables and spares were obtained from potential suppliers. Each cost-generating activity was identified as well as the underlying cost driver. The unit cost was multiplied by the monthly mining or processing schedule.

Major contributors to the operating cost include contract mining costs, process plant labour, reagents, water, spare parts, LPG and electric power consumption.

The total weighted average operating cost over the first 15 years is USD 15.44/ROM tonne and USD 73.36 per sales tonnes of Rutile and Garnet combined The operating cost estimates were developed from the production schedule and is summarized in Table 2-20 below.

Table 2-21: Operating Cost Summary

Item	Unit	Cost/t (USD)
Open Pit - Waste Mining	Waste tonne	1.68
Open Pit - Ore Mining	Ore tonne	1.87
Underground Mining	ROM tonne	10.17
Comminution	ROM tonne	2.36
Process	ROM tonne	8.89
Tailings Disposal	ROM tonne	0.51
Overheads	ROM tonne	1.96
Average Cash Cost[66]	ROM tonne	15.44
Average Cash Cost[57]	Sales tonne	73.36
Average Cash Cost Project lifetime[6]	ROM tonne	17.97
Average Cash Cost Project lifetime[6]	Sales tonne	107.93

2.14 Project Economics

The Financial Model developed for the Project consist of a combination of production and financial calculations, each of which is derived from first principals. The model estimates a cashflow forecast for each period during the Project lifetime.

2.14.1 Production Profiles

Based on the mining schedule and extensive process testwork, the following production profiles for rutile and garnet were derived from the financial model (volumes in tonnes). The annual production can be seen in Figure 2-25 and Figure 2-26. The average annual production of Rutile and Garnet in the first 15 years is approximately 34,000 tpa and 278,000 tpa, respectively.

Figure 2-25: Annual Rutile Production

[6] Average first 15 years
[7] Rutile and Garnet combined

Figure 2-26: Annual Garnet Production

2.14.2 Key Project Financials

The key financials for the Project are summarized in Table 2-22 below.

The NPV of USD 450 million is a real pre-tax value discounted by 8%, which is the assumed Weighted Average Cost of Capital (WACC). The IRR of 21.88% is real with no escalations applied. The Payback Period (< 5 years) is the number of years from start of operation until generated cashflow equals the capital cost invested. The Project lifetime is the number of operating years with ore reserves derived in line with the guidelines of the JORC Code.

The post-tax key financials have been calculated using a post-tax WACC of 8%. Post-tax NPV amounted to USD 344 million and IRR to 19.83% accounted for assumed leverage and general tax standards for depreciation. The corporate tax rate in Norway is 22%.

Table 2-22: Key Project Financials

Project Financials	Unit	Value
Pre-tax NPV @ 8.0%	USD million	450
Pre-tax IRR	%	21.88
Net Project Operating Cashflow (undiscounted)	USD million	2,160
Post-tax NPV @ 8%	USD million	344
Post-tax IRR	%	19.83
Payback Period	years	4.17
Product Price Assumptions (2019 dollars)		
Rutile Price	USD/Sales tonne	1,142
Average Garnet Price	USD/Sales tonne	248

2.14.3 Cashflow

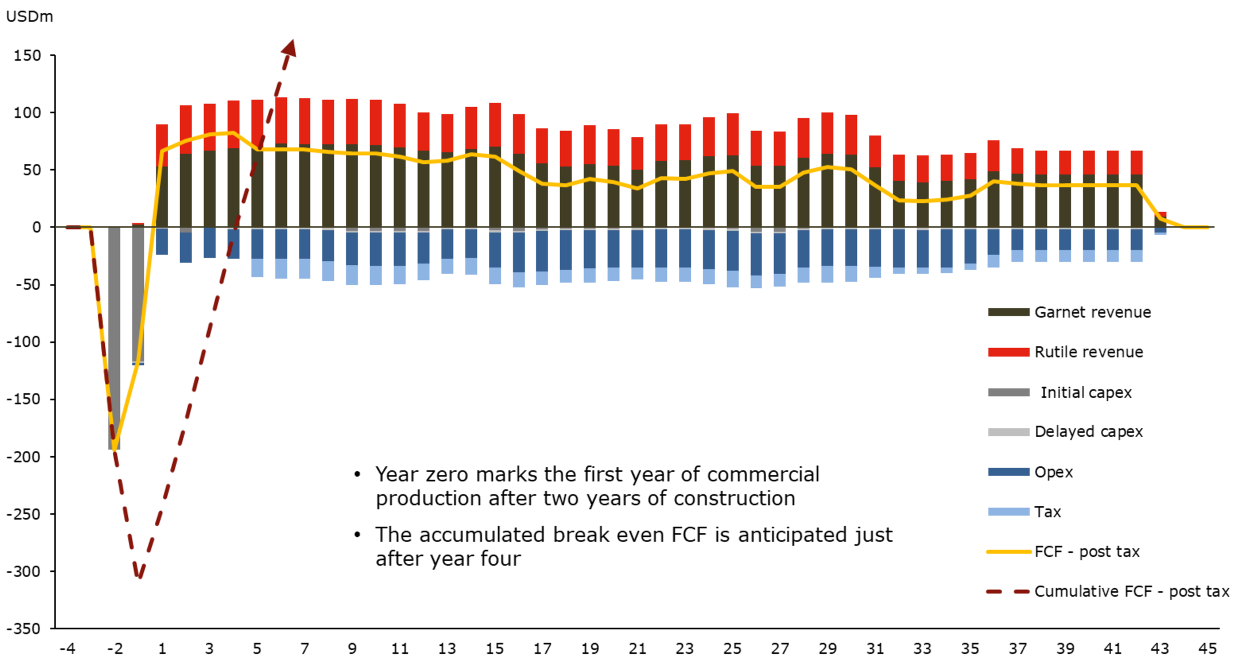

Figure 2-27: Cashflow components

2.14.4 Sensitivity

Figure 2-28 below illustrates that the NPV is positively correlated to Rutile revenue and Garnet revenue, and negatively correlated to capital cost (CAPEX) and operating costs (OPEX). Changes in Garnet revenue has a larger impact than changes in Rutile revenue. Changes in CAPEX has a slightly larger influence on NPV than OPEX. NPV sensitivities are linear to the various expanded components.

Figure 2-29 below illustrates that the IRR is positively correlated to Rutile revenue and Garnet revenue, and negatively correlated to CAPEX and OPEX. Changes in Garnet revenue has a larger impact than changes in Rutile revenue. Changes in CAPEX has a larger impact on IRR than changes in OPEX.

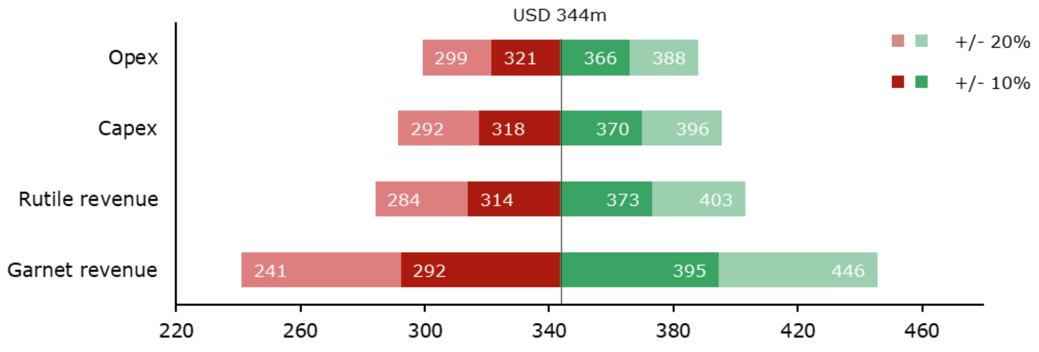

Figure 2-28: NPV Sensitivity

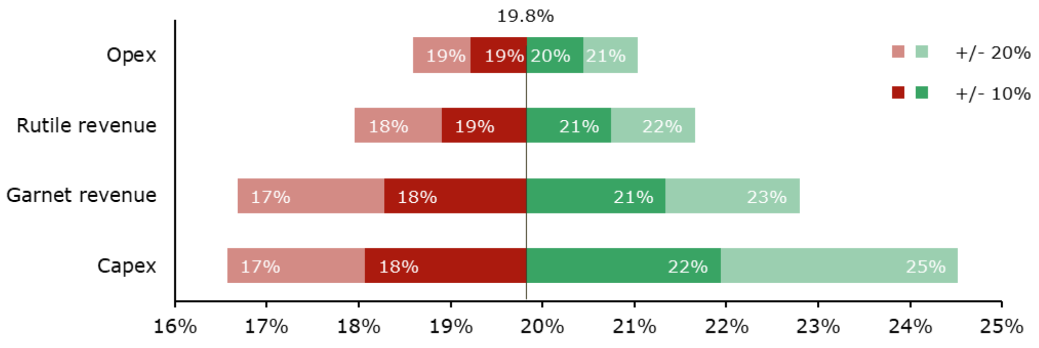

Figure 2-29: IRR Sensitivity

2.15 Market Analysis

2.15.1 Rutile

Titanium feedstock is the most critical input to the titanium pigment and titanium metal manufacturing processes. The key minerals mined to supply titanium feedstocks are ilmenite and rutile. While rutile may be used directly as feedstock, ilmenite is normally undergoing a smelting process to produce titanium slag and pig iron.

The global TiO_2 pigment market accounts for approximately 90% of total feedstock demand and is therefore the dominant driver of offtake. Titanium metal is the second consumer of feedstock accounting for approximately 5%.

The Australian market analysis group TZMI has for several years forecasted a significant reduction in the supply of rutile in the period 2017 to 2025. Global rutile supply for 2019 is estimated at 563,000 TiO_2 units, down approximately 23,000 TiO_2 units from 2018. A further significant decline in global rutile output is expected from year 2022 as seen in Figure 2-30.

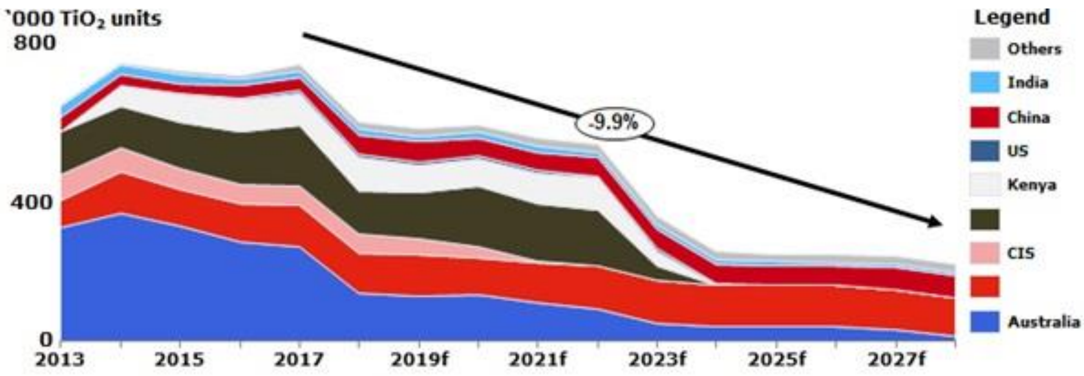

Figure 2-30: Global Rutile Supply 2013 - 2028

The reduction in rutile supply results from closure of major rutile mines in Australia and Africa. Although much of the decline will be offset by likely new supply to come in production, TZMI is forecasting a downward trend in rutile supply within the next 10 year period.

The increase in demand of rutile in global feedstock used for chloride applications is expected to be of approximately 10% in the next decade, while demand for rutile in the metal segment is expected to be approximately 20%.

Although there is a certain interchangeability between different high grade feedstocks, TZMI forecasts a significant supply deficit in rutile beyond year 2021.

Global demand for rutile is forecasted to grow towards 800,000 tonnes TiO_2 units per year in 2028, representing a gap in supply/demand of up to 300,000 tonnes TiO_2 units per year. The prevailing outlook for the rutile market leaves good offtake opportunities for the planned output from Engebø at around 34,000 tpa.

TZMI forecasts the average rutile price to increase in the next couple of years, after which it will trend downwards towards the anticipated long term inducement price for rutile being forecasted to USD 1,118 per mt of rutile (FOB, 2018 dollars) which translates to USD 1,142 in 2019 dollars. This is the long-term price assumption for the DFS financial analysis.

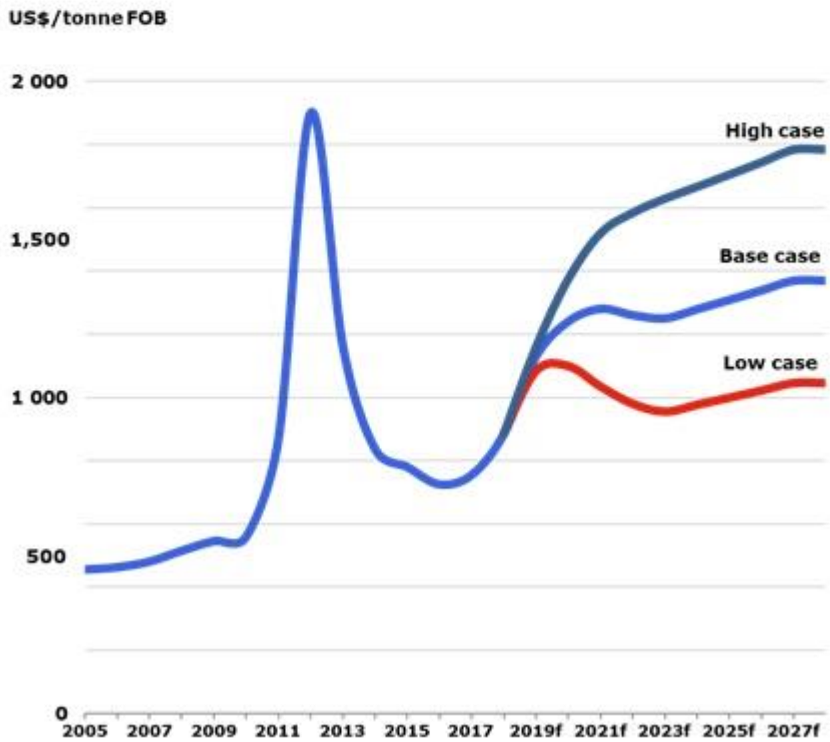

Figure 2-31: Nominal Rutile Price Forecast

Nordic Mining has entered into a Heads of Agreement (HOA) with a reputable Japanese trading house for supply and offtake of the majority of its production of rutile. The HOA also outlines the participation of the trading house in the construction financing of the Project.

2.15.2 Garnet

Garnet has for many years been an attractive abrasives mineral due to its hardness. Historically garnet has been applied in sand paper and for manual surface preparations, while the current primary markets for garnet are in abrasive blasting and waterjet cutting. The development of waterjet cutting machines paved the way for a rapid increase in the use of garnet during the 1990's. Production of waterjet cutting machines in China has also seen strong growth recently with an CAGR of 25% from 2013 to 2018.

Garnet is also utilized in abrasive resistant materials such as flooring, however in smaller volumes. In addition garnet is used for water filtration in combination with a range of other minerals. The total demand for garnet has remained stable during the last years at approximately 1.12 million tpa. Waterjet cutting and abrasive blasting represent the majority of this demand with approximately 80%. The demand has remained somewhat subdued during the last 5 years due to weak global growth since 2014 and also political ban of garnet export from India since 2016.

Global demand is expected to increase in the next decade with an average growth of approximately 4.2% CAGR towards year 2028. The waterjet segment will represent the strongest growth with approximately 5% CAGR as illustrated in Figure 2-32.

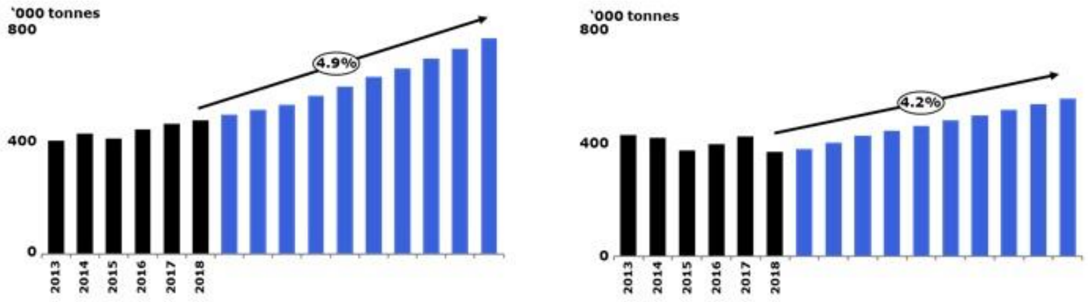

Figure 2-32: Garnet Product Demand 2028

Traditionally the main supply of garnet has come from Australia and India. Currently an increasing supply is originating from South Africa, while smaller volumes are produced in the US. Currently there is no production of garnet in Europe. China has increased its domestic production of garnet to over 300,000 tpa in 2018. Most of China's production are used domestically.

TZMI estimates the total production of garnet to increase to approximately 1.5 million tonnes in year 2028.

The supply/demand pattern of garnet, as well as pricing has been affected by the abruption of Indian garnet supply as well as increase of imports from China. The forecasted growth in the waterjet market segment should indicate a good position for Engebø garnet in the European market, as well as overseas markets.

TZMI forecast the average price of garnet to increase from USD 260 per tonne in 2022 to USD 300 per tonne in year 2028 (FOB nominal USD). The long-term average price assumtion for garnet in the DFS financial analysis is USD 248 per tonne.

Nordic Mining has signed a Heads of Agreement (HOA) with the Barton Group for offtake of garnet to the Americas. The HOA also outlines the participation of Barton Group in the construction financing of the Project.

2.16 Risks and Opportunities

A robust risk assessment process was followed through the DFS whereby both qualitative and quantitative risk approaches were undertaken. Information was accumulated into a quantitative risk analysis of the capital estimate and project execution schedule, to derive the total capital risk profile. Given that project capital and operational costs can be impacted by estimate uncertainty, schedule uncertainty, revenue uncertainty and risk events, an integrated process was followed:

- A schedule risk profile model was developed to capture duration uncertainty and schedule risk events that result in variations to the deterministic schedule. The schedule was used to assess the cost impact of time variable capital costs that will vary in line with schedule variations from the plan
- A capital cost risk profile model was developed to understand the potential variability in the base cost estimate
- A project risk register risk event model was developed to understand the potential impact of project risk events on schedule and cost.

The risk analysis, using a Monte Carlo simulation method, resulted in a contingency risk allowance from the capital base estimate of USD 290.03 million to the statistical Mean value of USD 310.71 million, equating to USD 20.67 million or 7.13% of the base estimate. The Project implementation schedule is targeting September 2022 for the completion of cold commissioning, carrying a six week schedule risk allowance to the Mean of October 2022. Through the rigour of the QRA workshop, attended by Nordic Mining and Hatch, risks were accounted for, recognizing that further risk treatment and mitigation strategies will be carried out the during the next Project stage to gain further definition and confidence.

Appendix 1 – Preliminary Integrated Project Construction Team