Keliber Oy

LITHIUM PROJECT

Definitive Feasibility Study – Executive Summary

June 14, 2018

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1. Executive Summary

1.1 Introduction

Keliber has completed a definitive feasibility study (DFS) for a project to produce 11 000 tpa of battery grade lithium carbonate from spodumene-rich pegmatite deposits in Central Ostrobothnia, Finland ("the Project"). The study includes Mineral Resource and Ore Reserve estimates which comply with the JORC Code 2012 and specifies the process treatment route. Capital and operating costs have been determined and a discounted cash flow model developed to assess the project economics. The current life of mines is 13 years but the project is extended to 20 years by purchasing spodumene concentrates from third parties for 7 years after the mines, based on the current resources, are exhausted. There exists significant exploration potential in the area giving the possibility to continue the operation from own reserves, too.

Environmental and community aspects of the Project have been addressed to ensure that the positive impacts are known and any potential negative impacts of the Project are minimised and there is full compliance with all Finnish environmental regulations, permits and international guidelines.

1.2 Economic Analysis

The economics of the project have been evaluated with an Excel-based real-basis financial model developed in 2018 Euros to present the cost structure and the economic evaluation of the project as a stand-alone entity. The lithium carbonate price is taken from the Roskill market report using the real inflation adjusted base case which ranges from USD10 320 in 2020 to USD 13 931 in 2032; this value is used from 2032 to the end of the Project. An exchange rate of 1.21 USD to Euro is used in the financial evaluation. The project cash flows were assessed to 2039. The financial model has been used to estimate future cash flows and evaluate the project on the basis of net present value (NPV), internal rate of return (IRR) and payback period. The results of the analysis are provided in the Table 1-1.

The values obtained for NPV, IRR and the payback period show that the Project is profitable.

The total unit operating cost for lithium carbonate from Keliber's own ores is €4 427 which is equivalent to USD5 357 at an exchange rate of 1.21 (USD to €).

The Project life is extended by purchasing concentrates from third parties when the Keliber mines are exhausted. The extended project life increases the Project NPV and IRR although the operating cost averaged over the project life is also increased. The total unit operating cost for lithium carbonate over the life of the project is €4 866.

Post-tax free cash flow over the life of the project is summarised in Figure 1-1.

Table 1-1: Financial Evaluation Summary

Description	Unit	Value
LOM (total life of operations)	Years	13 (20)
Total Ore Tonnes Mined	Mt ore	7.41
Annual Mine Production	ktpa average	570
Total Spodumene Concentrate Produced	Mt conc	1.48
Annual Spodumene Concentrate Production	ktpa average	112
Total Spodumene Concentrate Purchased (years 14-20)	Mt	0.62
Total Battery Grade Lithium Carbonate Sold	t Li_2CO_3	214 898
Battery Grade Lithium Carbonate Sold from Mine Spodumene Concentrate Production	t Li_2CO_3	137 898
Battery Grade Lithium Carbonate Sold from Purchased Spodumene Concentrates	t Li_2CO_3	77 000
Annual Battery Grade Lithium Carbonate Sold	tpa average	10 745
Revenue	€M	2 281
OPEX		
Mine OPEX	€M	211
Unit Mine OPEX	€ / t ore	28.5
Concentrator	€M	117
Unit Concentrator OPEX	€ / t concentrates	79
Conversion & Hydrometallurgical Plants OPEX	€M	661
Unit Conversion Plant OPEX	€ / t Li_2CO_3	3 077
Other Fixed Costs and G&A	€M	56
Unit Other Fixed Costs and G&A OPEX	€ / t Li_2CO_3	262
Total OPEX	€M	1 046
Unit Total OPEX (over total life of project)	€ / t Li_2CO_3	4 866
Unit Total OPEX (produced from Keliber ore)	€ / t Li_2CO_3	4 427
EBITDA	€M	1 213
CAPEX		
Direct	€M	205
Indirect	€M	50
Total CAPEX	€M	255
Permit Application Fees	€M	1
Sustaining Capital	€M	25
Closure Costs	€M	12
Royalties	€M	10
Pre-Tax NPV @ 8%	€M	295
Post-Tax NPV @ 8%	€M	225
Pre-Tax IRR	%	24
Post-Tax IRR	%	22
Pre-Tax Payback Period	Years	5.5
Post-Tax Payback Period	Years	5.7

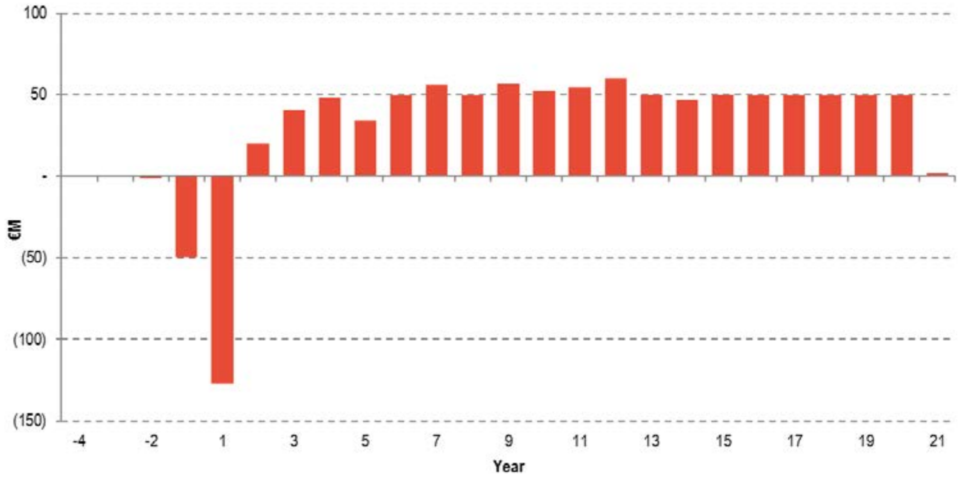

Figure 1-1: Free Cash Flow Summary

The financial analysis completed examined the IRR sensitivity to the main factors affecting the Project, namely, upfront development capital, operating costs and the price of battery grade lithium carbonate. Currently, the only input to the model in USD is the price of battery grade lithium carbonate therefore the sensitivity for the USD Euro exchange rate is perfectly overlaid on the sensitivity for the price of battery grade lithium carbonate. The results are shown in Figure 1-2. The project is most sensitive to changes in the price of battery grade lithium carbonate, less sensitive to changes in upfront capital costs and least sensitive to operating cost changes.

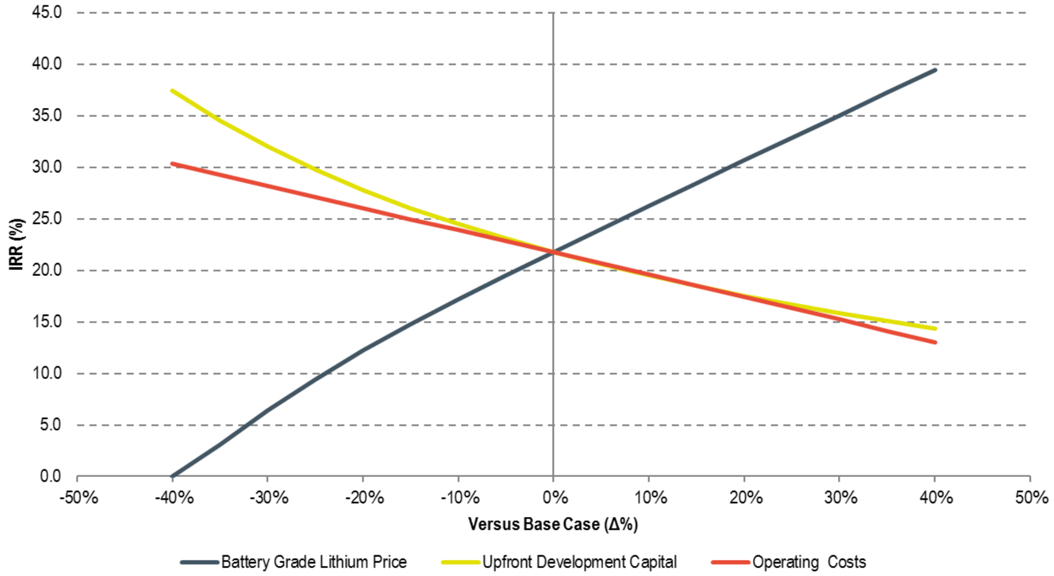

Figure 1-2: IRR Sensitivity Post Tax

1.3 Terms of Reference and Objectives of the Study

The scope of work includes the development of Mineral Resource and Ore Reserve estimates of the lithium deposits, which comply with the JORC Code 2012, and completion of engineering studies to treat the lithium ore by mineral processing, conversion and chemical processing to produce 11 000 tpa of battery grade lithium carbonate. The engineering studies are based on test work carried out in internationally recognised facilities. Subsequently capital and operating cost estimates have been developed for the Project. The capital and operating cost estimates are in line with AACE Class 3 estimates, with an order of accuracy of ±15%.

Environmental aspects of the Project are important and have been studied in depth to ensure the impact of the Project is minimised and there is full compliance with all Finnish environmental regulations, permits and international guidelines.

1.3.1 Study Contributors

The DFS report (the Report) was prepared by the Keliber project team, which comprises several individuals and companies, and edited by Hatch as the technical coordinator of the DFS. In total twenty parties have contributed to the Report, each having a specific area of responsibility.

1.3.2 Project Background and Project Description

Keliber undertook its first drilling campaign in the area in 2004 and there has been on-going exploration since this time. Over the years several test work programmes have been completed to advance the development of the Project and in March 2016 a prefeasibility study (PFS) was completed. The PFS report indicated sufficiently positive financial results to warrant proceeding to a definitive feasibility study. This was started in late 2016 for a project involving:

- Open pit mining of four deposits in the area, namely the Rapasaari, Syväjärvi, Länttä and Outovesi deposits
- Extended underground mining in Rapasaari and Länttä and solely underground mining in Emmes
- A conventional concentrator comprising crushing, optical sorting, grinding and flotation to produce a spodumene concentrate
- Conversion of the spodumene concentrate from alpha to beta spodumene
- Soda leaching in an autoclave and hydrometallurgical processing to produce battery grade lithium carbonate.

1.3.3 Effective Date and Declaration

This report is considered effective as of 14 June 2018. As stated earlier the estimates of the Mineral Resources and Ore Reserves given in this report are in accordance with the JORC Code 2012. The comments in this report reflect Keliber's best judgement in the light of the information available at time of the preparation of the Report.

1.3.4 Sources of Information and Site Visits

This Report is based, largely, on separate reports prepared by different specialists, organisations, experts and Keliber's internal reports and maps. Qualified Persons have made numerous visits to the sites since 2010.

1.4 Reliance on Other Experts

The geological information for this report has been provided by Pentti Grönholm, the Chief Geologist at Keliber. Pekka Lóven and Markku Meriläinen have prepared mineral resource estimates as Qualified Persons.

Ore reserve estimates have been prepared by Pöyry Finland Oy by competent persons under the supervision of Ville-Matti Seppä MSc (Geology), Eur Geol acting as the Qualified Person.

1.5 Property Description and Location

1.5.1 Location and Area of Property

The Project is located in Central Ostrobothnia, Western Finland. The Concentrator is at Kalavesi and the Chemical plant at Kokkola Industrial Park (KIP). The mining areas are close to the concentrator. Figure 1-3 shows the location of the proposed operations.

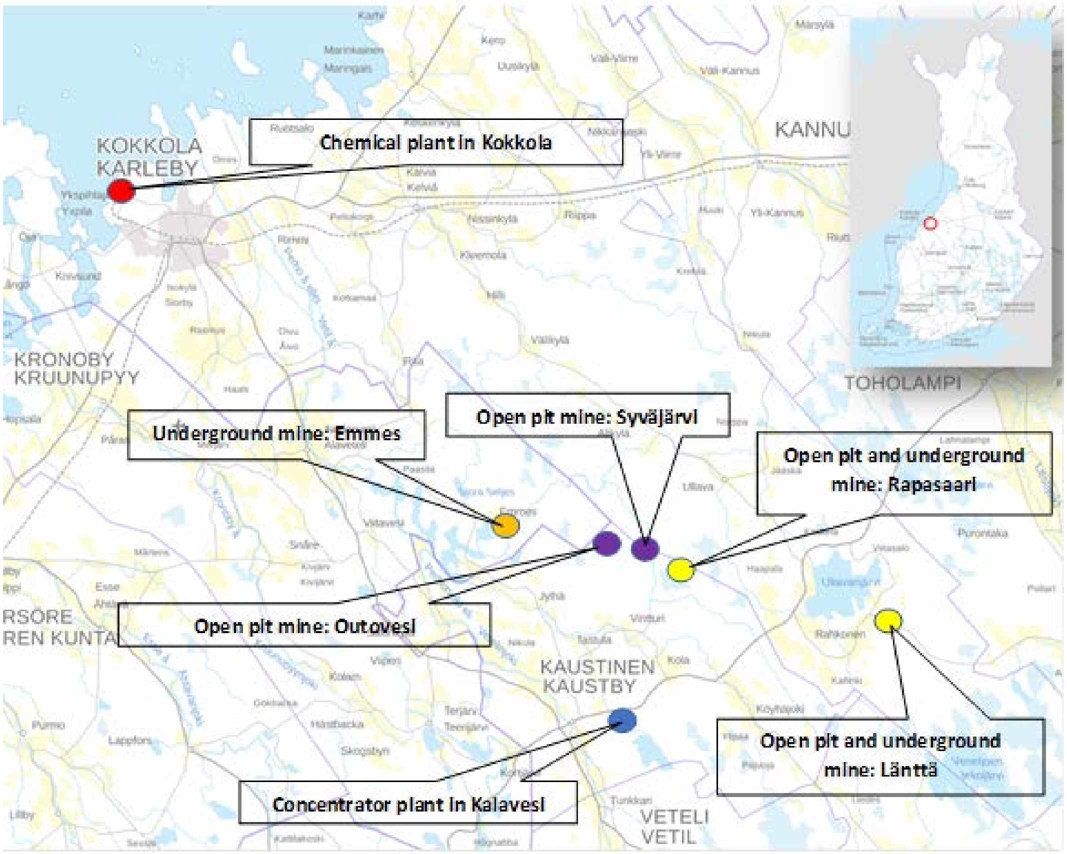

Figure 1-3: Location of operations

1.5.2 *Mineral Tenures*

In total Keliber has 28 exploration permits and claims covering a total area of 1 957 ha; Keliber holds 100% interest in these. Keliber holds a mining permit in Länttä for an area totalling 37.5 ha. In addition, Keliber has reservations on an area covering 2 479 km^2. In February 2018 Keliber submitted an application for a mining permit for the Syväjärvi mine site.

1.5.3 *Property Ownership and Agreements*

Exploration licences of Syväjärvi, Leviäkangas and Rapasaari areas were acquired from the Government of Finland between 2012 and 2014. Keliber has 100% ownership of 41.73 ha of land area in Outovesi which was purchased from private landowners in 2011. This land area covers approximately 20% of the current claim areas of Outovesi (209.67 ha).

In addition to mining at Outovesi, Keliber will conduct mining activities in other mine sites in land areas owned by private landowners. The establishment of a mine and undertaking of mining activity are subject to a mining permit. When a mining permit is granted, it entitles Keliber to exploit the mining minerals found in the mining area and certain surface materials as well as to perform exploration within the mining area. As a compensation to landowners, Keliber will pay an annual excavation fee to the owners of land included in the mining area. The annual amount of the excavation fee per property is 50 euros per hectare. In addition, there are payments related to the value of the products mined.

Part of the land area (approximately 24 ha) of the Kalavesi Concentrator area is owned by the municipality of Kaustinen. The rest of the land area of the Kalavesi site is owned by private landowners and organisations. Keliber has preliminary agreements for the purchase of approximately 97% of the land area required.

1.5.4 *Royalties*

There is an agreement between the Government of Finland and Keliber concerning the Leviäkangas, Syväjärvi and Rapasaari deposits (that were originally discovered by Geological Survey of Finland and Keliber bought the rights in 2012 and 2014 respectively) whereby Keliber shall pay to the Republic of Finland a royalty of EUR 0.5 per ore tonne after the start of mining operations. This amount is subject to a periodic price adjustment which has been defined in the agreement.

1.5.5 *Environmental Liabilities*

The old landfill site of the Kaustinen municipality, which operated between 1973 and 1996 and closed in 1997 is in the immediate vicinity of the Kalavesi site. Under the Environmental Protection Act and in the Law on Replacing Environmental Damage the responsibility for cleaning up the contaminated area can be transferred to the new owner. However, in an agreement with the municipality of Kaustinen related to the acquisition of land area, the old landfill site is excluded. Therefore, all liabilities associated with the past activities which took place at the landfill site remain under the full responsibility of the municipality of Kaustinen.

1.5.6 *Permits required and Current Status*

As of the effective date of this Report Keliber has two environmental permits and a mining permit for the Länttä area. However, before mining can start Keliber will have to submit supplementary information for the mining permit; this can only occur at the end of the EIA procedures. Mining permits are required for each of the mining areas. Environmental permits will also be needed for the mining areas. Keliber has to apply for an amendment to the existing environmental permits for Länttä mine and Kalavesi Concentrator.

In addition, under the Water Act, Keliber is required to have a water permit for abstracting and discharging water in the area; usually this is applied for simultaneously with the environmental permit application. In addition, under the Water Act water permits are required for draining Lake Syväjärvi and Lake Heinäjärvi.

A separate mining safety licence is also required for each mining operation.

Under the Regulation on the Control of Hazardous Chemicals Handling and Storage (685/2015) Keliber must notify the authorities of the chemicals and the amount of chemicals used as well as the handling and storage of these chemicals. A safety and rescue plan related to these chemicals is also required.

Construction of buildings and structures requires a building permit granted by municipalities in the project areas. The construction of new, privately-owned roads or the upgrading of existing private roads requires a licence under Section 37 of the Road Act (503/2005). Improving the existing private road connections also requires an application.

The Nature Conservation Act requires special provisions for the protection and conservation of protected flora and fauna in the Project area. However, Keliber has applied for permission to deviate from the provisions of this Act in relation to the moor frog in Syväjärvi mine area. The permission to deviate from these provisions was granted in February 2018 and the permissions became legally valid at the end of April 2018.

1.5.7 Risks to Access, Title and Operations

All the exploration permits, claims and mining permit of Länttä are registered in the name of Keliber. As of the effective date of this Report, all tenures are in good standing. The expiry dates for the exploration permits and claims range from 29 October 2018 to 18 May 2022. It is possible to extend the permits and claims according to Finnish Mining Act.

1.6 Accessibility, Climate, Local Resources, Local Infrastructure and Physiography

1.6.1 Accessibility

The mine sites are accessible to the Kalavesi site via gravel roads, public roads and highways. The distance between the mine sites and Kalavesi concentrator site range from approximately18 km to 25 km.

The Kalavesi Concentrator is in the municipality of Kaustinen and is approximately 5 km from the municipality centre. The Kalavesi site has excellent road connection to the Chemical Plant, which is about 58 km to the North, via Highway 13.

The Chemical Plant is in the Kokkola Industrial Park (KIP), which is approximately 6 km from the centre of the city of Kokkola, with excellent road connections, railway connections and it is 2 km from the port of Kokkola.

1.6.2 Physiography

The area of Central Ostrobothnia and the area of Keliber's operations are characterised by a relatively flat topography. The elevation of the mine sites ranges from between 82.7 m above mean sea level in Rapasaari to 122.0 m above mean sea level in Länttä. There is no permafrost at these latitudes. Overburden cover at the mine sites ranges in depth from 0 m to 20 m.

1.6.3 Climate

The climate in Finland is so-called intermediate climate, combining characteristics of both a maritime and a continental climate. The annual average temperature in Central Ostrobothnia area is circa plus 3˚C. The coldest time of the year is typically in January or in February with the average temperature between minus 6 and minus 8˚C. The warmest time of the year occurs, on average in July, with the average temperature of plus 16˚C.

The annual amount of precipitation in Central Ostrobothnia varies between 500 and 600 mm. In Central Ostrobothnia the number of days with snow cover varies between 110 to 155 days. Snow cover is deepest in late winter, typically in early March being 300 mm to 400 mm.

1.6.4 Local Resources and Infrastructure

The Central Ostrobothnia province has a population of approximately 69 000 inhabitants and Kokkola is the largest city of Central Ostrobothnia having around 48 000 inhabitants. The municipality of Kaustinen has approximately 4 300 inhabitants. There are two universities in the town of Kokkola and the social amenities normally associated with a town of this size.

The KIP area has 70 hectares of land zoned for use by the heavy chemical industry. Keliber's Chemical Plant is immediately adjacent to several important resources such as water, steam, electricity, heat, gas (e.g. CO_2) and acids (e.g. sulfuric acid), which are all produced in KIP area.

For international oversea shipments, the Port of Kokkola, is open all year round. It is the largest port serving the mining industry in Finland and has an All Weather Terminal (AWT). The Port of Kokkola also has the Deep Port for handling bulk cargoes. There is regular container service from Kokkola to Antwerp.

The Kaustinen municipality water pipeline (potable water supply) is located immediately adjacent to the Kalavesi site. The main power line, at 110 kV, reaches the centre of Kaustinen municipality circa 4.2 km from the Kalavesi plant site.

Central Ostrobothnia is serviced by Kokkola-Pietarsaari airport and by regular Finnair flights and charter flights. The area is also serviced by mobile phone networks from all the main Finnish service providers as well as a fibre optic network from a local service provider.

1.7 History

1.7.1 Prior Ownership

The first owner of the mining rights to the Länttä, Emmes, Jänislampi, Leviäkangas and Syväjärvi deposits was "Suomen Mineraali Oy", followed by "Paraisten Kalkkivuori Oy" and then "Partek Oy" from the early 1960s to the early 1980s. The mining rights to these areas expired in 1992; between 1992 and 1999 the area was unclaimed. Olle Siren, with few private partners, established Keliber working group and claimed first the Läntta deposit in 1999; later the Emmes and Jänislampi deposits were also claimed. The Geological Survey of Finland (GTK) held the ownership of the Leviäkangas, Syväjärvi and Rapasaari deposits in the period from 2003 to 2012.

Currently Keliber owns the mining rights to Läntta and claims/exploration permits to Rapasaari, Syväjärvi, Outovesi, Emmes and Leviäkangas.

1.7.2 Exploration History and Development Work

Spodumene was first identified as a mineral in the late 1950s in the Kaustinen region. An intensive boulder hunting and drilling campaign was successful with the discoveries of the Läntta, Syväjärvi, Leviäkangas, Jänislampi and Emmes deposits.

The Keliber working group started evaluation of the area for lithium in 1999. The first drilling campaign by Keliber was undertaken at Läntta in 2004. In 2010 Keliber extended its exploration to the whole of the Kaustinen-Kokkola area.

GTK explored the area between 2003 and 2012. As a result, GTK prepared resource estimates for the old Leviäkangas and Syväjärvi deposits, as well as discovering the new Rapasaari deposit and some lithium deposit indications for future exploration.

The **Läntta** deposit was first drilled and investigated in the late 1970s by Partek Oy. The project was considered uneconomic and Partek Oy relinquished the mining rights in 1992.

Keliber acquired the mining rights for the Läntta deposit in 1999 and started more detailed exploration, exploitation and environmental studies, partly assisted by GTK. The main drilling phases were in the periods 2004-2005 and 2011-2013.

The **Syväjärvi** deposit was discovered based on boulder indications in the 1960s and investigations were continued in the 1980s. GTK undertook exploration and drilling of the deposit between 2006 and 2010.

Keliber acquired the exploration rights for the Syväjärvi deposit in 2012 and started an intensive inventory drilling programme. Two drilling campaigns were carried out, the first in 2013 and the second in 2014. A few holes were also drilled in 2016 together with six underground holes at the end of an exploration tunnel. In the autumn of 2017, 8 new holes were drilled and 8 previously drilled holes were extended at the main and northern areas of the deposit.

The **Rapasaari** deposit was discovered in 2009 by GTK, which carried out many investigations including geological boulder mapping, a geophysical ground survey, systematic till sampling, analytical and mineralogical studies and drilling.

Keliber acquired the mineral rights for the Rapasaari deposit in 2014 and carried out three drilling campaigns, from 2014 to 2017, to clarify the deposit structure and to drill sufficient holes to upgrade the resources to the indicated category. During the period of May 2017 to March 2018, a total of 33 new holes were drilled and 17 previously drilled holes were extended at Rapasaari.

The **Leviäkangas** deposit was discovered in the 1960s and investigations continued into the 1980s. GTK undertook exploration and drilling of the deposit between 2004 and 2008 then prepared a resource estimate in 2010.

Keliber acquired the exploration rights for the deposit in 2012 and started an inventory and exploration drilling programme. In total, three drilling campaigns were carried out between 2012 and 2014.

The **Emmes** deposit was found in the 1960s and early exploration continued until 1981. Keliber acquired the exploration rights for the deposit in 2012 after which time it started to re-log and re-analyse old drill core.

Keliber carried out a small drilling campaign in 2014. In the winter of 2018 extensive drilling on the ice cover was possible. Four new holes were drilled to verify the previous resource model and eight holes were drilled to check the extensions of the known deposit.

The **Outovesi** deposit was discovered as a result of Keliber's own exploration in 2010. A few holes were drilled in 2012 and 2013 to test the extension of the known deposit and possible new veins.

1.7.3 Historical Resource Estimates

Resource estimates were prepared after exploration campaigns at various times but before the work undertaken by GTK and Keliber the estimates were not classified.

1.7.4 Historical Reserve Estimates

No modern reserve estimates were made prior to the work by Keliber.

1.8 Geological Setting and Mineralisation

1.8.1 Regional Geology

The Kaustinen-Kokkola area belongs to the Paleoproterozoic Pohjanmaa Schist Belt, which forms a 350 km long and 70 km wide arc-shaped belt between the Central Finland Granite Complex in the east and the Vaasa Migmatite Complex in the west. The most common rock types within the Pohjanmaa Belt are mica schists and gneisses, which are intercalated with metavolcanic rocks. The supracrustal rocks have been divided into two groups, the Evijärvi and the Ylivieska groups. The Kaustinen Lithium pegmatite area is located at the northern continuation of the Evijärvi group with the metamorphic grade in the Bothnian Schist Belt varying from low amphibolite facies in the eastern part to high amphibolite facies towards the Vaasa Granite Complex. The metamorphic peak conditions took place at about 1.89 to1.88 Ga in amphibolite facies conditions. The U-Pb age of manganocolumbite for the Länttä albite-spodumene pegmatite is ca 1.79 Ga, which is considered as the crystallization age of the pegmatite.

Locations of known lithium and REE pegmatites in Finland are shown in Figure 1-4.

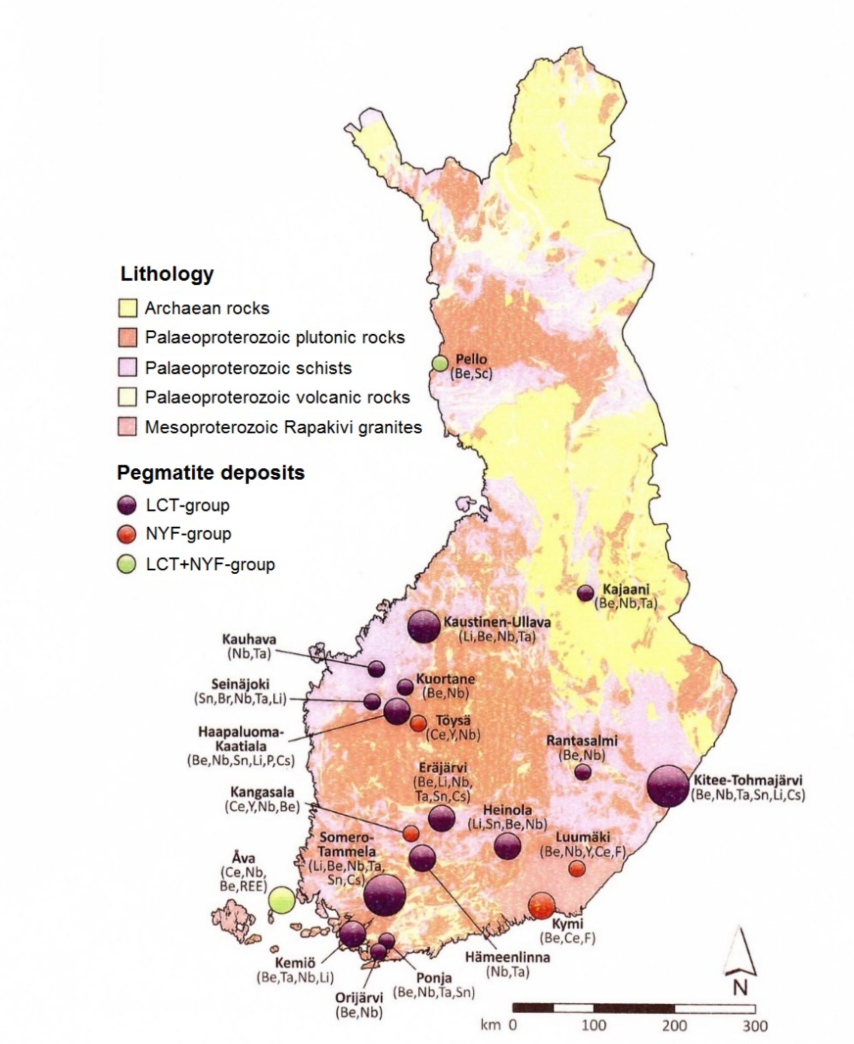

Figure 1-4: Locations of known lithium and REE pegmatites in Finland

1.8.2 Local Geology

More than ten separate pegmatite occurrences are known in the Kaustinen-Kokkola-Kruunupyy area, however, none of the spodumene pegmatites are exposed at surface, being covered by quaternary sediments, mainly till. The indications, quality and contact relationships can often be seen only in erratic pegmatite boulders or in drill core.

Typically, the Paleoproterozoic country rocks which host the pegmatite veins are mica schist with coarse grained metagreywackes, or intermediate or mafic metavolcanic rocks. Sedimentary mica schist formations include some graphitic and sulphidic horizons, varying from graphite mica schist to black schist. Both the metasedimentary and metavolcanic rocks contain narrow skarnated inclusions or layers. Massive granite or other intrusive bodies are not found close to the discovered lithium pegmatites.

Pegmatite veins or vein swarms are usually parallel to bedding but can also cross cut the country rock bedding features. In cutting vein structures, spodumene pegmatite is more homogenous, lacking the smaller veins. Pegmatite veins also seem to be bundled to the regional folding structure which has been identified aerially but is yet to be understood in detail.

Locations of the pegmatite veins in the Kaustinen-Kokkola-Kruunupyy area are shown in Figure 1-5.

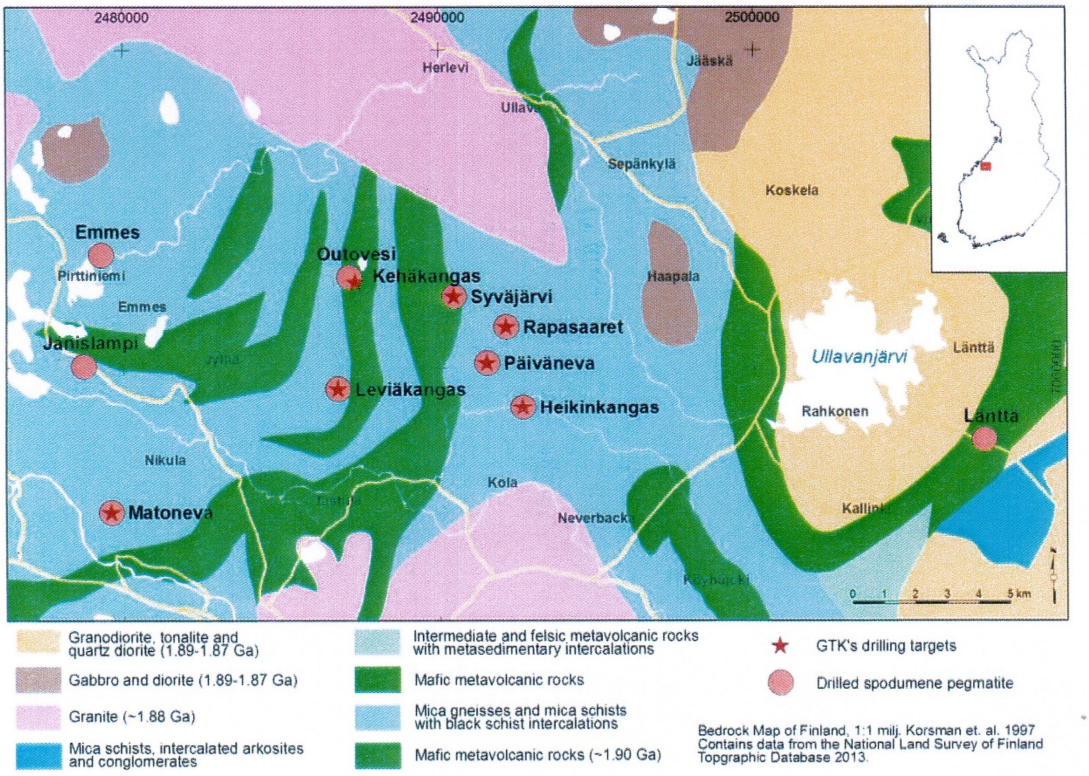

Figure 1-5: Geology and location of the main lithium pegmatite deposits and indications in the Kaustinen-Kokkola-Kruunupyy area

1.8.3 *Property Geology*

The property geology is based largely on the GTK exploration results because Keliber has only carried out detailed geological, geochemical, mineralogical and geophysical investigations on limited areas.

At **Länttä**, the bedrock is covered by basal till, varying in thickness from 1 m to about 7 m with the pegmatite veins hosted by metavolcanic intermediate rocks, metagreywacke schists and plagioclase porphyrite. The spodumene pegmatite consists of two veins parallel to the host bedding and with a maximum thickness of the two veins of about 10 m. The total length of the veins is about 400 m based on drilling results from 2004 and 2005.

At **Syväjärvi**, bedrock is covered by sandy till with a mean thickness of about 5 m with the pegmatite veins intruding and cross cutting host mica schist and metagreywacke in an anticlinal structure. Metavolcanic rocks include metatuff, lapille metatuff, meta-agglomerate and plagioclase porphyrite. The thickest drilled pegmatite intercepts are 20 - 30 m in true thickness. The pegmatite veins at Syväjärvi dip under Lake Syväjärvi and a 71 m tunnel was driven into the deposit from the lake edge to enable bulk sampling.

At **Rapasaari**, the bedrock is covered by peat and till, varying in vertical thickness from 3 m to almost 20 m with the pegmatite veins intruding mica schist and metagreywackes in a synclinal system. Metavolcanic rocks occur in the central area between Rapasaari East and West and include metatuff or metatuffite and small zones of plagioclase porphyrite. The thickest veins have a true thickness close to 20 m.

At **Outovesi**, the bedrock is covered by till with a mean thickness of 10 m with the pegmatite veins being hosted by mica schist and metagreywacke. At Outovesi the length of the deposit is almost 400 m. The thickest veins have a true thickness close to 13 m.

At **Leviäkangas**, the bedrock is covered by till with a mean thickness of 7 m with the pegmatite veins being hosted by mica schist and metagreywacke. The main deposit is about 250 m long and the maximum thickness is close to 15 m.

At **Emmes**, the bedrock is covered by till with a mean thickness of 10 m with the pegmatite veins being hosted by mica schist and metagreywacke. The pegmatite vein is about 400 m long and the maximum thickness is about 20 m. Drilled pegmatite intersections reach over 28 m with the true thickness being 70-90% of the drilled intersection.

Mineralisation

Pegmatites in this region have been classified into the albite-spodumene subgroup of the LCT (Li, Cs, Ta) pegmatite family. These Paleoproterozoic 1.79 Ga (U-Pb columbite age) albite-spodumene pegmatites crosscut the Svekofennian 1.95 to 1.88 Ga supracrustal rocks, which are composed of mica schists, metagreywackes and volcano-related metasediments with some intercalations of sulphide-bearing black schists. The LCT-pegmatites are younger than the 1.89 to 1.88 Ga peak of regional metamorphism. Large pegmatite granites in the Kaustinen area have been interpreted as a potential source of the albite-spodumene pegmatites.

1.8.4 Mineralogy and Geometallurgy

The spodumene pegmatites of the Kaustinen area resemble each other petrographically, mineralogically and chemically. They are typically coarse grained, light coloured and mineralogically similar, having albite (37-41 wt%), quartz (26-28 wt%), K-feldspar (10-16 wt%), spodumene (10-15 wt%) and muscovite (6-7 wt%) as the main minerals and generally in this quantitative order. Pegmatites show small variations in the distribution of the main minerals but well-developed internal zonation is mainly lacking. The only systematic texture observed is the perpendicular orientation of spodumene crystals to the pegmatite vein contacts.

Studies show that the chemical, mineralogical and geometallurgical differences between the six deposits are small. Currently, spodumene is the only economic mineral identified in the pegmatite veins; other lithium minerals for example petalite, cookeite, montebrasite and sicklerite are found only as trace quantities. Columbite-tantalite is an important accessory mineral having potentially some economic significance. The Li_2O content of spodumene is 7.0%, 7.21% and 7.22% for Syväjärvi, Rapasaari and Leviäkangas, respectively. The main impurity in spodumene is iron, FeO content of the mineral varying in the deposits between 0.3 and 1.2%.

Variation in the grindability between the deposits is small and geometallurgical studies show that the hard component in the ores is spodumene and therefore the specific grinding energy shows positive correlation with the lithium grade. In flotation response deposits show small differences mainly due to variation in the lithium head grade. Variation in the ore texture, spodumene grain size, colour or alteration does not have impact on processability. The wall rock dilution has been found to have negative impact for flotation lowering the concentrate grade. In this sense Syväjärvi, where the wall rock dilution is plagioclase porphyrite, has proven to be slightly easier to process than other deposits hosted by mica schist. Minimising the wall rock in flotation is important and therefore selective mining and optical sorting will play a significant role in controlling the flotation feed.

1.9 Exploration

1.9.1 Background

Throughout the exploration history in Central Ostrobothnia, pegmatite boulder hunting and mapping have been the most effective methods of discovery. During exploration this area was investigated by magnetic surveys and/or till geochemistry sampling before drilling. Across the area lithogeochemistry is an important exploration method as a pegmatite deposit often has a Li-Rb-Cs halo. The halo can be up to ten times larger than the vein and is therefore easier to discover.

Most of the deposits were discovered in the 1960s using boulder hunting and tracing boulder fans to the North-West that is the regional direction of glacier drifting.

Extensive exploration by GTK and Keliber has resulted in several drilled spodumene pegmatite veins and even more boulder indications of yet undiscovered deposits. Large areas are covered by peat, sand or clay without boulders. These areas are planned to be explored in the future using litho- or till geochemistry with detailed geophysics.

1.9.2 Geological, Geochemical and Geophysical Surveys

All modern geodata has been surveyed using hand-held GPS or precision-GPS equipment. The locations of historical data are based on topographic maps and the surveyed field lines. The coordinate system used is the Finnish National coordinates either KKJ2 or KKJ3.

Since very few outcrops exist in the exploration area geological mapping is limited to boulder mapping and logging.

Large geochemical anomalies were discovered by GTK re-analysing the old till samples collected in the Kaustinen-Kokkola-Kruunupyy area in the 1970s and 1980s. GTK also sampled till on a local scale in the Rapasaari area which led to the discovery of that deposit.

The whole area is covered by low-altitude magnetic and electro-magnetic measurements, surveyed using aircraft by GTK, which enables structural interpretations. Magnetic data have been utilised based on the non-magnetic character of pegmatites and the magnetic nature of the country rocks.

For geotechnical studies, rock quality designation (RQD) is measured systematically for all the drill holes during core logging. Based on orientated core bedding, jointing and pegmatite contacts are defined in most of the drilled holes.

1.9.3 Endowment / Exploration Potential

Keliber has many untested target areas with boulder indications. Some target areas have previous drilling indications of spodumene pegmatite, together with a large number of boulders. The three clear targets of this type are Päiväneva, Heikinkangas and extension of Leviäkangas.

Geochemical lithium indications in till extend in all direction from the central deposit area. There are many spodumene bearing boulders, both new and earlier discovered and the bedrock source of many spodumene pegmatite boulders is still undiscovered. These together with regional geological and air-borne geophysical data give an excellent base for new economic discoveries which would enable the life of mine to be extended and prolong the production of lithium carbonate from Keliber's concentrate.

1.10 Drilling

1.10.1 Historical Drilling

The first drilling programmes were undertaken in 1961 using small drill rigs and the core diameter was 22 mm. From 1966 to 1981 a larger core diameter of 32 mm was used. The core diameter in the drilling programmes by GTK from 2004 to 2012 is 42 mm. The drilling programmes of Keliber in all the active deposits have been executed using similar core sizes and drilling practices. GTK has operated most of the non-Keliber drilling in the Syväjärvi, Rapasaari and Leviäkangas deposits.

1.10.2 Drilling Methods

Keliber employed a Finnish drilling company for all its drilling. The rig type was the wireline Onram 1000 and the casing size used was WL66 with a drill core diameter of 50.7 mm. A normal run (length of the core sample tube) is three meters.

An iron casing rod was left in the completed holes, which were capped using an aluminium cap with the hole indication. These casings extend through the overburden into the bedrock so that it is possible to extend the hole and undertake in-hole surveys.

The common drilling grid is 40 by 40 m, which is adequate for classification of resources to the indicated category. Drilling was previously extended vertically mainly to a depth of approximately 100 m, targeting only the open pit mineable resources. In 2017-2018, a few deeper holes (250-370 m) were drilled at Rapasaari. Currently, the deposits are still open at depth and the deepest intersection is at a vertical level of 220 meters.

1.10.3 Geological Logging

Drill cores are logged at the Keliber's facilities in Kaustinen following the guidelines of Keliber's drill core logging manual.

During mineralogical logging attention was focused on spodumene by recording crystal size, orientation, colour and estimated quantity. RQD was also measured. In the latest drilling phases at Rapasaari in 2016-2018, the orientation of drill core was measured for each three meter run. Orientation of pegmatite contacts, general bedding and jointing were measured when possible.

1.10.4 Collar Surveys

Collar coordinates were measured using was a Topcon Hiper Pro GL RTK and the coordinate system used was the Finnish KKJ2 or KKJ3. The accuracy of the GPS-measuring system is 2 to 3 cm. In 2016-2017, for drilling programmes in Rapasaari the collars and start azimuths were surveyed by Ramboll Oy with a Trimble R 10 instrument. Since September 2017, collar coordinates have been surveyed by Keliber staff with its own precision-GPS, Leica GS16.

1.10.5 Downhole Surveys

The start azimuth was measured together with collar surveys by setting a rod with two hanging strings into the drill hole rod, setting an orientation stick to a distance of 15 to 20 m by sighting with the strings, measuring both collar and orientation stick coordinates and to the end calculating the hole azimuth. Bending of the holes in short holes is usually insignificant and most of the holes are orientated perpendicular to the vein deposit. The hole dip in the shallow holes (less than 100 m) was measured using a DeviDip instrument. The measuring interval of the dip is 10 m. In longer holes both the in-hole azimuth and dip were surveyed using the DeviFlex instrument at intervals of 4 m.

1.10.6 RC and Core Recovery

No RC drilling was executed at any of the prospects. The core drilling recoveries and RQD values in separate deposits are shown in Table 1-2.

Table 1-2: Core loss and RQD values of the deposits

Deposit	Drill holes number	Total length m	Core loss %	RQD mean %	RQD = 0 %	RQD < 20 %
Syväjärvi	47	2 586.95	0.43	89.1	1.19	3.11
Leviäkangas	21	1 018.15	0.26	76.1	0.70	3.31
Outovesi	27	1 617.85	0.31	85.5	2.23	3.45
Länttä	41	2 395.00	0.18	75.8	1.09	5.33
Rapasaari E	21	1 607.05	0.70	52.7	3.52	18.72
Rapasaari, incl. also deeper new drill holes	28	4 911.40	0.13	82.5	0.61	2.04
Emmes	10	1 048.40	0.15	83.2	0.19	0.80

1.11 Sample Preparation, Analysis and Security

1.11.1 Sample Logging and Preparation

The boundaries used in logging and sampling are the same and are either lithological, structural or mineralogical. The logging/sampling length in the pegmatite varies from 0.2 to 2.0 m. After logging, the core boxes were photographed dry and the pegmatites also wet. The logging data (depths, core loss, RQD, rock type and sample numbers) were documented in an Excel spread sheet for use in the resource estimations. The data were transformed to an Access database. Core was cut by an automatic diamond saw. Half of the core was subject to the following routine; dried, weighed, measured for specific gravity (SG), dried again, packed into plastic bags and sent to the laboratory for preparation and analysis. Keliber has updated quality manuals for drill core logging and cutting.

1.11.2 Quality Assurance and Quality Control Procedures (QA/QC)

The logging and sampling processes were subject to essential standardised QAQC protocols. For each drilling campaign a separate QAQC document is compiled to ensure accuracy of data.

The drill core to be used for analysis is cut by a diamond saw. A correlation is expected between the sample length and weight, considering small differences in SG and broken, non- homogenous core with possible core loss. Most of the pegmatite core is unbroken with 100 % RQD and no loss of core recovery.

Accuracy and precision have been tested in the Keliber drilling programmes by using every tenth sample for testing validation. A comprehensive system has been developed by Keliber using replicate and duplicate samples to give good quantitative confidence to the analytical results.

1.11.3 Core Lengths and Weight Checks

Sample length and weight are plotted on regression plots to check for any outliers. Some variation exists in the regression plots but there are no clear indications, for example, of samples being mixed.

1.11.4 Analytical Methods and Laboratories

Two separate laboratories (ALS and Labtium) were used for the analysis of samples during the period from 2010 to 2018. The procedures for sample preparation and analysis are specified and both laboratories have been subjected to checks and tests. In 2013 checks showed that results from ALS were 10-15% lower, based on certified reference material, due to difference in analysis method. Labtium results have been consistently good when measured against certified reference samples. Therefore, the mineralised pegmatite samples were re-analysed at Labtium.

All the samples used in the resource estimation have been analysed by the same and proven analytical method of Labtium. In some cases, details of the method of analysis are not known and therefore the results from the analysis of these samples have not been used in the resource estimation.

1.11.5 Analytical Standards and Blanks

In order to test the laboratory for analysis accuracy standard samples were prepared using blasted and fresh spodumene ore samples from the Länttä deposit. The blank sample is from homogenous Lumppio granite. The standard samples were prepared and certified by Labtium.

1.11.6 Duplicates and Re-Analysis

Typically, the pegmatite contains 10-20% spodumene and it is therefore anticipated that the nugget effect in pulp samples should be negligible. The spodumene crystal size is large compared with the core size and for this reason precision was tested using core replicates. The primary samples were half of the core and the replicate samples were an additional quarter of the core. The laboratory re-analysed the pulp samples and the results show that the mean grades are close to each other and to pulp duplicates. The mean absolute differences of core replicates are much higher (0.14% Li_2O) than that of the of pulp duplicates (0.03% Li_2O).

1.11.7 Specific Gravity Determination

Specific Gravity (SG) was measured using the classical immersion method. Most of unbroken half core pieces were weighed and the weights varied between 0.5 and 4.0 kg depending on the core length of the sample. Two SG standards were used, a sedimentary rock core standard (SG 2.822 ± 0.003 kg/dm^3) and an aluminium bar (SG 2.715 ± 0.003 kg/dm^3. The standards measured consistently inside the variation limits throughout the testing.

Specific gravity (SG) of spodumene pegmatites varies mainly depending on the spodumene content. Depending on the ore grade (usually 10-20% spodumene) the SG varies between 2.65 and 2.80 kg/dm^3. Generally, the pegmatites are nonporous and unbroken and therefore the wet and dry SG are identical.

The test work undertaken indicated at a Li_2O grade of 7% (pure spodumene) the SG would be about 3.15 kg/dm^3, which is the general SG of spodumene. The variation of SG in the spodumene pegmatites is small. It is therefore the case that the SG values used for the resource estimates are robust.

1.12 Data Verification

1.12.1 Historical Data

Keliber has carried out several checks on historical data, including re-logging, re-assaying, database validations and collar location verifications. Some of the historical drill holes, whose collar locations could not be verified are not taken account in mineral resource estimations. However, historical drill holes of the Emmes deposit from the1960s which have unverified collar location have been used in mineral resource calculations because details were validated by Keliber in 2014 and 2018.

Keliber has re-logged historical drill cores according to the company logging procedures and manual. The historical drill cores are also partly re-assayed from Länttä deposit by GTK in 2001 and from Emmes deposit by Keliber in 2014.

1.12.2 Data Verification by the Competent Person (CP)

During site visits by the Competent Persons several collar positions, both Keliber and pre-Keliber, were field checked using a handheld GPS. These collar locations were found to match the database locations within the accuracy of the GPS instrument.

Keliber’s QAQC procedures which have been followed since 2010 were verified and considered to be adequate for project development.

The integrity of the digital drill core data used in resource estimation was verified. No discrepancies or data entry errors were observed in the data records.

The CP has also verified the pegmatite vein type, style of spodumene mineralisation and the contact features of spodumene pegmatite against the country rock through logging of drill core and observations at the available outcrops of mineralisation in the Länttä test pit and in the exploration tunnel of Syväjärvi. The geological mapping results support the deposit modelling and resource estimation.

In addition, the database was audited using Surpac software; no overlapping or missing sample errors in intervals used for grade estimations were found.

It was concluded that collar, survey, lithology and assay tables of drill hole databases in each deposit are free of errors and are adequate for resource estimations.

1.13 Mineral Processing and Metallurgical Testing

1.13.1 Introduction

There have been several stages of metallurgical test programmes undertaken to develop a process for the beneficiation of the pegmatite spodumene deposits of Central Ostrobothnia and the subsequent processing of the spodumene concentrate to produce battery grade lithium carbonate as the final, saleable product. Early work was pre-2014 with more recent work undertaken during the Pre-feasibility study 2014 to 2016 and for the Definitive Feasibility study 2016 to 2018. Both laboratory and pilot plant tests have been completed since 2016.

The main stages of the mineral processing were determined in the 1970s with only optical ore sorting being introduced later. Keliber's product will be lithium carbonate produced via a continuous soda pressure leaching process, developed with Outotec. The process flow diagram consisting of three parts: mineral processing, conversion and a hydrometallurgical process, is shown in Figure 1-6.

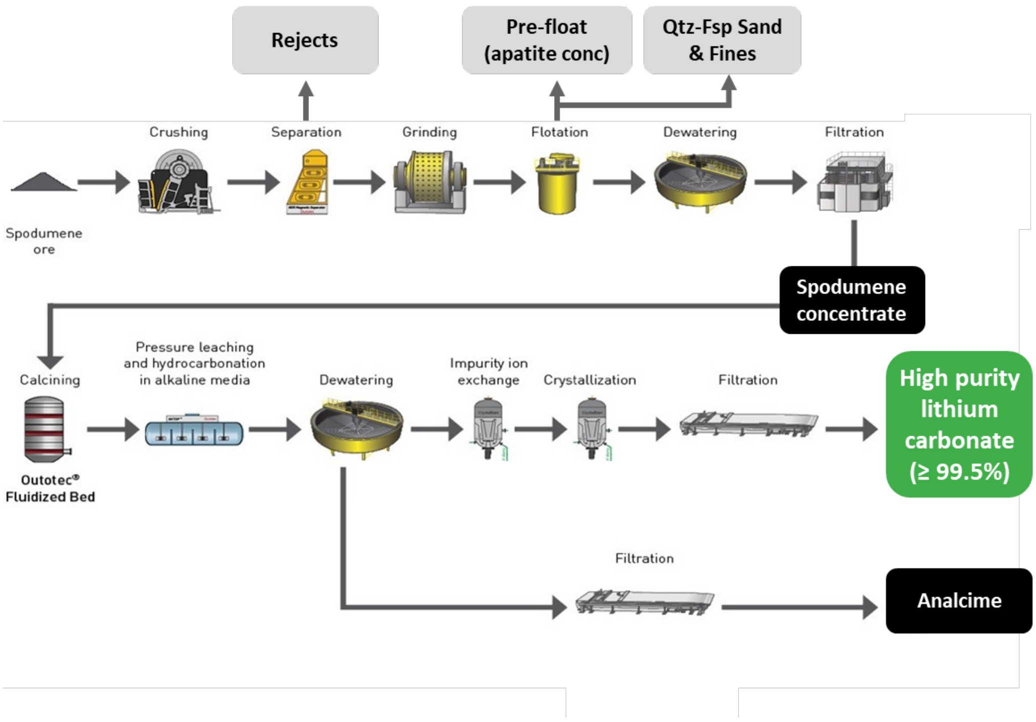

Figure 1-6: Simplified flowsheet of the Keliber process route

1.13.2 Historical Testing

The first tests studied the lithium deposits between 1976 and 1982. The research covered the mineral processing tests to produce spodumene concentrate as well as its by-products: quartz, feldspar and mica concentrates. The work undertaken was adequate to enable an investment decision to be made but the project was not pursued owing to the low market demand at that time.

Keliber restarted metallurgical testing in 2003 which led to the preliminary engineering for a spodumene concentrator and a lithium carbonate production plant. The mineral processing included two-stage grinding, gravity separation, de-sliming, pre-flotation, spodumene flotation and dewatering. Conversion from alpha to beta-spodumene was undertaken in a rotary kiln and the hydrometallurgical process included pressure leaching of beta-spodumene in a soda environment, solution purification with ion exchange, and precipitation of lithium carbonate. Subsequent changes to the process route have been relatively slight.

1.13.3 Mineral Processing for Prefeasibility Study (PFS) & Definitive Feasibility Study (DFS)

The purpose of the mineral processing circuit is to produce spodumene concentrate for the downstream process. Optimisation of the full production chain and the capability of the chemical plant to treat concentrates of various grades has resulted in Keliber's design value for concentrate grade being 4.5% Li_2O; however the test work has been done for a range of 4.0-6.0% Li_2O.

In the PFS, Läntä samples were processed to produce spodumene concentrates which were then treated to convert alpha spodumene to beta spodumene and used for hydrometallurgical testing. The Läntä samples were processed in a pilot plant test comprising dense media separation (DMS), rod mill grinding with gravity separation followed by laboratory scale flotation. The best result achieved was a combined concentrate grading 5.03% Li_2O with a recovery of 82.3%.

The processing of a Syväjärvi sample was also included in the PFS which confirmed that it could be treated using a similar flowsheet as that for the Läntä sample, although higher recoveries were realised for a concentrate with a Li_2O grade of 4.5%. A further Syväjärvi sample was included in the DFS tests with the full Keliber process being tested at pilot scale. As Syväjärvi showed good behaviour in flotation and DMS produced elevated P_2O_5 concentration in the spodumene concentrate, which is undesirable, DMS was not included in the pilot process. In this test work it was found that the biggest lithium losses were in the primary de-sliming and the spodumene rougher tails, totalling 9 to 10%.

An optical ore sorting test programme was carried out which utilised a colour line scan CCD camera and a near-infrared scanner. The technique was found to be practically perfect in removing black plagioclase porphyrite waste rock from the feed with only 3% of the Li_2O being lost.

To determine the optimum flotation parameters for both Syväjärvi and Läntä ores, further laboratory tests were carried out at the Geological Survey of Finland (GTK). Work was carried out to attempt to recover spodumene from slimes by flotation but the results were poor.

The DFS also included a geometallurgical study of Syväjärvi, Läntä, Rapasaari and Emmes deposits to determine the differences between the ore bodies and variation within the deposits. The grindability of the samples was found to be a function of the spodumene grade but no difference was found between the ores. The flotation performance was also dependent upon the spodumene grade and inversely dependent upon wall rock dilution.

The flotation tests revealed a significant difference between the deposits with Syväjärvi showing the best performance with a recovery of 92% followed by Länttä and Rapasaari.

Rapasaari is the biggest Keliber ore body and subsequent mineral processing testing in 2017-2018 showed that the recovery level was close to that for Syväjärvi.

Emmes ore showed a similar flotation response as Syväjärvi; with a 91.8% lithium recovery at a 4.5% Li_2O concentrate grade and 91.0% at a 5.0% Li_2O grade.

1.13.4 Conversion

PFS testing established that both the Länttä and Syväjärvi ores could be processed to convert alpha-spodumene to leachable beta-spodumene. Further tests were conducted for the DFS over a temperature range of 1000 °C to 1075 °C and X-ray diffraction and Raman spectroscopy analyses confirmed that over 95% alpha-to-beta conversion had taken place.

1.13.5 Hydrometallurgical Processing To Produce Lithium Carbonate

The PFS hydrometallurgical testing began with the Länttä concentrate and incorporated all the major process stages from the spodumene concentrate conversion to lithium carbonate production. The samples were prepared to have an average grade of 4.5% Li_2O. The lithium yields in the leaching and bi-carbonation tests were low with 86% being the best laboratory result. Higher lithium yields were, however, obtained in a pilot-plant testing with the autoclaves able to deliver longer mixing times during the heating and cooling periods. Decreasing the particle size of the beta-spodumene resulted in an improvement in the lithium leaching. This delivered a lithium yield of 91%; lithium losses were from the coarser particles.

Ion exchange was used to remove metal impurities from the leach solution to realise a crystallised Li_2CO_3 product containing 17.3 to 18.6 weight-% lithium; the main impurities were phosphorus and silica.

The PFS also tested Syväjärvi samples and the realised lithium leaching yield was 95.6%. The tests were repeated in the DFS when lithium yields up to 95% lithium were achieved in batch tests and up to 87% in the pilot plant. Ion exchange was again employed to remove the metal impurities so that the crystallised Li_2CO_3 product contained 17.3 to 19.0 weight-% lithium.

The final test programme comprised laboratory testing of conversion, soda leaching, bi-carbonation, ion exchange and crystallisation of Syväjärvi and Rapasaari concentrates. Lithium yields of 90-96% for Syväjärvi and 88-95% for Rapasaari concentrate were obtained. Lithium carbonate was crystallised from Syväjärvi samples with a grade of over 99.5% without ion exchange being employed. The ion exchange, however, decreased the calcium level from 0.02 – 0.05% to less than 0.01%.

1.14 Mineral Resource Estimate

The Mineral Resources have been estimated and reported in accordance with the guidelines of the JORC Code 2012 by the independent consultants Markku Meriläinen (MAusIMM) and Pekka Loven (MAusIMM, CP).

1.14.1 *Drill Hole Database and Data used for Resource Modelling*

The data used for the geological modelling and grade estimation is summarised below in Table 1-3.

Table 1-3: Summary of drilling data used in the resource estimate

Deposit	No. of Drillholes	Drill Spacing (m)	Total Meters	No. of Assayed Intervals	Analyses
Syväjärvi	101	40 x 40	9,552.75	1,176	Li_2O, Nb, Be, Li, Ta, BeO, Ta_2O_5, Nb_2O_5
Rapasaari	166	40 x 40	23,463	7,897	Li, Li_2O, Be and BeO
Läntta	105	30 x 30 to 50 x 50	8,733.38	821	Li_2O, Al_2O_3, SiO_2, K_2O, CaO, Fe_2O_3, Rb, Nb, Be, Li, Ta, BeO, Ta_2O_5
Outovesi	24	40 x 40 to 40 x 60	1751.7	476	Li_2O, BeO
Emmes	54	30 x 40 to 40 x 60	6283.79	1,167	Li_2O, BeO

Prior to the grade estimation, all data was validated using Surpac software for missing and overlapping samples. No errors were discovered when creating the drill hole database.

The coordinate system used was the national FIN KKJ2. The topographic and bedrock surfaces were prepared using surveyed information (such as drill hole collar and other), combined to national topographic data.

1.14.2 *Orebody Model*

For the orebody modelling, a cut-off grade of 0.5% Li_2O was used in all cases with the wireframes created acting as hard boundaries during the estimation of grade. The orebody models created were used for coding the drill hole file into separate estimation domains.

At **Syväjärvi**, the resource outlines were constructed on east-west cross sections at intervals of 30 - 40 m. In cross section, the distance between the separate drill holes varies from 10 m to 30 m in the main part of the largest spodumene pegmatite body and from 20 m to 50 m in the more marginal zones of the main spodumene pegmatite body and in the three smaller parallel veins.

One dominant (lens like in a cross section) spodumene pegmatite vein and four smaller veins subparallel to the main vein were constructed. Only the spodumene pegmatite veins, with dimensions that were sufficient for mining, with contacts reported to cut the host rock layering in the specific angle, which prove it to be approximately in parallel position with the main body, were modelled.

At the **Rapasaari** prospect, a total of 24 spodumene pegmatite veins were modeled using both lithological and assay information. The direction of continuity is based on geological logging information including the measured orientations of vein contacts. The resource outlines were constructed based on the lithological and assayed intervals on cross sections that were spaced at 20 - 50 m according to the drill hole spacing.

At Rapasaari Main, the modelled veins strike NNW-SSE and dip 40 - 60 degrees to the west. The modelled veins strike NNE-SSW and E-W sub vertically at Rapasaari West and North, respectively. Most of the modelled veins have intruded parallel to the primary bedding of the supracrustal host rock.

At **Länttä**, the resource outlines were constructed on cross sections at drill hole profile spacing of 5 - 50 m. Outlines of digitised veins are based on the lithological and assayed intervals. Three separate, parallel veins, with dimensions sufficient for mining, were modeled.

At **Outovesi**, the resource outlines were constructed on cross sections at intervals of 40 m based on the lithological and assayed intervals. The 3D model was continued approximately 15 m from the last drilled cross section in the northeastern and southwestern ends of the deposit. The model was continued at depth approximately 5 - 15 m from the lowermost drill hole information. One uniform spodumene pegmatite vein, which dimensions were sufficient for mining, was modelled.

At **Emmes**, the resource outlines were constructed on cross sections at intervals of 20 - 40 m based on the lithological and assayed intervals. In some rare occasions it was necessary to include material below the cu-toff to maintain the continuity of the structure. Only one vein, which dimensions were sufficient for mining, was modelled.

1.14.3 Li2O_mod

Originally, a nominal cut-off grade of 0.5% Li_2O was used for the unaltered spodumene pegmatite vein to separate the recoverable resource from unrecoverable Li_2O up to 0.2 - 0.4% found in the hanging wall and footwall contacts along with internal waste zones. During the resource estimation, this unrecoverable Li_2O was removed by creating so called modified assay record (Li2O_mod), in which more than 50% waste rock type containing assay intervals were marked as -1 (missing assay). During the resource estimation, all assay intervals marked as -1 were treated as 0% Li_2O.

1.14.4 Basic Statistics

A statistical study has been carried out at each deposit following the creation of the spodumene orebody wireframes.

1.14.5 Compositing

Two sets of composites were created: “Li2O_diluted” where missing samples (waste intervals) were calculated at zero grade and “Li2O_insitu” where missing samples were totally ignored. Insitu grade represents the Li_2O grade of spodumene pegmatite without waste. The diluted grade represents the grade of mineral resource.

Compositing of the drill hole samples is carried out to standardise the database for the further use in the grade estimation. This step eliminates any effects relating to the sample length, which may exist in the data. The composite length chosen was based on the dominant sample length at each deposit with Table 1-4 showing the composite length selected.

Table 1-4: Composite Length

Deposit	Composite Length
Syväjärvi	2.0 m
Rapasaari	1.5 m
Länttä	2.0 m
Outovesi	2.0 m
Emmes	2.0 m

1.14.6 *Block Model*

Block models were created using the orebody wireframes with the block model framework being shown in Table 1-5 for each deposit.

Table 1-5: Block Model Framework

Deposit	YXZ Minimum	YXZ Maximum	YXZ Max Block Size	YXZ Min Block Size	Rotation
Syväjärvi	7061900, 2490250, -90	7062700, 2490700, 90	10,10,5	5,5,2.5	-
Rapasaari	7060400, 2491700, -200	7061400, 2492800, 100	10,5,5	5,5,5	-
Länttä	7057700, 2506900, -100	7058400, 2507450, 125	10,5,5	10,5,5	45° Y
Outovesi	7066600, 3338350, -25	7067350, 3338650, 95	10,5,5	10,5,5	30° Y
Emmes	7063200, 2479500, -150	7063815, 2479900, 50	15,10,10	7.5,5,5	-45° Y

1.14.7 *Grade Interpolation and Estimation*

For all deposits, an Inverse Distance (IDW) cubed estimate has been used to interpolate Li_2O assays into the block mode created. Each domain was estimated separately using the composites belonging to the respective orebody domains. The cubed IDW method was chosen because some of the internal waste fragments have a random direction and random length and it was therefore required to give a higher weight to the nearest samples.

The interpolation parameters used in the IDW estimate is shown in Table 1-6.

Table 1-6: Interpolation Parameters

Deposit	Pass 1,2,3 Search Radii	Min No. of Samples	Max No. of Samples	Ellipse Orientation (YXZ)
Syväjärvi	40m, 80m, -	3	15	315, -18, 0
Rapasaari	40m, 80m, -	3	15	Variable
Länttä	40m, 80m, -	3	15	45, 0, -65
Outovesi	40m, 80m, 160m	3	15	30, 0, 60
Emmes	40m, 80m, -	3	15	125, 0, -60

1.14.8 *Block Model Validation*

The grade estimate has been validated through visual and statistical methods. The visual validation of input composite grade and output block model grade did not show any discrepancy.

Table 1-7 shows a comparison of the mean composite Li_2O grades against the estimated block model Li_2O grades. As shown, only a small discrepancy is observed.

Table 1-7: Block Model vs Composite Li_2O grade

Deposit	Mean Li_2O Composite Grade (%)	Mean Li_2O Block Model Grade (%)
Syväjärvi	1.20	1.22
Rapasaari	1.12	1.12
Länttä	1.05	1.04
Outovesi	1.39	1.43
Emmes	1.18	1.16

SWATH plots were also created for each deposit with a good correlation shown between the composite grades and estimated assay grades for Li_2O.

1.14.9 *Density*

Average density values were applied to the estimated resource models. Table 1-8 shows the density values applied and number of samples tested. The density has been used to determine the tonnage of each block and the deposit as a whole.

Table 1-8: Density values assigned to the block model

Deposit	No. of Samples	Average Density (tonne/m^3)
Syväjärvi	444	2.73
Rapasaari	434	2.72
Länttä	57	2.72
Outovesi	34	2.72
Emmes	57	2.71

1.14.10 *Mineral Resource Classification*

The assignment of appropriate mineral resource classification category has primarily been based on the geological understanding, geological complexity and associated drill hole spacing. In general, the drill hole spacing and associated geology and assay information has enabled simple and continuous spodumene pegmatite veins to be modelled.

1.14.11 *Mineral Resource Statement*

Table 1-9 shows the final Mineral Resource Statement dated May 2018. The Mineral Resources have been estimated and reported in accordance with the guidelines of the JORC Code 2012 by the independent consultants Markku Meriläinen (MAusIMM) and Pekka Loven (MAusIMM, CP). All deposits reported at 0.5% Li_2O cut-off grade except for Emmes which is reported at a cut-off grade of 0.7% Li_2O.

Table 1-9: Mineral Resource Statement May 2018

	Syväjärvi		Rapasaari		Länttä		Outovesi		Emmes		Leviäkangas		Total	
	Mt	Li_2O %	Mt	Li_2O %	Mt	Li_2O %	Mt	Li_2O %	Mt	Li_2O %	Mt	Li_2O %	Mt	Li_2O %
Measured	0.79	1.32			0.42	1.09							1.21	1.24
Indicated	1.38	1.20	4.43	1.13	0.91	1.02	0.28	1.43	1.08	1.22	0.19	1.14	8.26	1.15
Sub-Total	**2.17**	**1.24**	**4.43**	**1.13**	**1.33**	**1.04**	**0.28**	**1.43**	**1.08**	**1.22**	**0.19**	**1.14**	**9.47**	**1.16**
Inferred	0.06	0.9	0.17	1.46							0.3	0.90	0.53	1.08
											Grand Total		**10.00**	**1.16**

1.15 Ore Reserve Estimate

1.15.1 Estimate Principles and Methodology

Ore reserve estimates for Syväjärvi, Länttä, Rapasaari Outovesi and Emmes deposits, were calculated using modifying factors. All data unless otherwise stated were received from Keliber. The level of information used is adequate in to demonstrate that the economic extraction of the deposits can be justified.

Open pit optimisation was used to evaluate the maximum economic open pit sizes for the ore reserve statement. The resulting maximum sizes were used as a basis for the final engineering design of the open pit shapes. An additional geotechnical study was performed to evaluate the most suitable open pit overall slope angles (OSA) and design parameters.

The open pit optimisation was performed using Whittle software (Version 4.5). Whittle calculates the cash flow and net present value (NPV) of the open pit using the Lerchs-Grossmann algorithm to generate a series of open pit shells.

1.15.2 Geological Block Model

The block models including mineral resources were received from Keliber. All mining operational costs were included in the models by Pöyry before optimisation. The block models for Syväjärvi, Rapasaari, Länttä, Emmes and Outovesi included the following items:

- Resource class (Measured, Indicated and Inferred categories). Only Measured and Indicated resource categories were used in the optimisations
- Ore grades
- Internal and external dilution
- Diluted feed grade for optimisation.

The following items were not included in the block model:

- Overburden or air coding
- Specific gravity or density information (these were applied to the mining volumes in post-calculations).

1.15.3 *Pit Optimisation Parameters*

The pit optimisation parameters include Mineral Resource estimation block model, all necessary operational costs, time costs, processing costs and selling costs of the final concentrate.

1.15.4 *Capital Investments*

All capital investments were excluded from the optimisation. The investments have no direct impact on the open pit sizes in the optimisation.

1.15.5 *Discount Rates*

An annual discount rate of 8% was used in the optimisation procedure. No inflation was applied to the production costs. The optimisations were performed in Real Euros.

1.15.6 *Royalties*

The optimisation was completed under the assumption that there are no royalties associated with mining leases in Finland.

1.15.7 *Capacity and Production Scenario*

The annual ore feed to the processing plant was set at 600 000 t which would provide the targeted production rate of approximately 11 000 tpa output of lithium carbonate product.

1.15.8 *Processing Recovery*

For the open pit optimisation, the mineral processing (flotation) recoveries were adjusted based on the deposit being optimised while the Conversion and Chemical Plant recovery was fixed.

1.15.9 *Mining and Transportation Costs*

All mine operating cost estimates are based on quotations from three contractors.

The operating costs used in the optimisation are calculated and coded to the geological block model in Surpac.

1.15.10 *Processing Costs*

The processing costs used in the optimisation procedure were prepared by Keliber in February 2018. The processing cost used as an input for the optimisation is 57 €/t ore. Small variations in the processing cost were tested in the open pit optimisation and it was determined that these variations will not materially affect the open pit sizes and ore reserves.

1.15.11 *Mining Throughput Limits*

The maximum annual ore mining rates for the optimisation was set to 600 000 tonnes in all open pits. No mining rate maximum was applied to any waste rock mining. This was done to avoid constraining ore mining due to waste rock mining.

1.15.12 *Mining Dilution*

Mining dilution is a sum of multiple factors including:

- Selected mining method in question
- Mining equipment type, size and minimum mining width
- Nature, extend and geometry of the ore body

- Quality of managed grade control.

All the geological resource block models include internal waste rock and external waste dilution. Hence no additional dilution factors were applied during the open pit optimisation phase.

1.15.13 Mining Recovery

The average mining recovery factor of 95% was applied to the optimisation, and for the ore reserve calculation.

1.15.14 Cut-Off

A Li_2O cut-off grade of 0.5% was used in all open pit optimisations. The cut-off grade was estimated using breakeven cost/profit analysis. For the ore reserve conversion, a cut-off of 0.45% Li_2O was used to define reserves within the optimised pit shell.

1.15.15 Product Price

Keliber provided a price assumption of €9 918 (USD10 910) per tonne lithium carbonate. No selling costs were included in the open optimisation.

1.15.16 Open Pit Constraints

The only physical pit limit constraint that was added to the optimisations is in the Syväjärvi deposit where the Lake Heinävesi is located at the east side of the planned open pit. The open pit wall was constrained so that the lake will remain mostly unchanged.

1.15.17 Specific Gravity

For the optimisation and for the Reserve calculations a specific gravity of 2.73 was used for ore.

1.15.18 Open Pit Shell Selection Criteria

In the deposits, where only open pit mining is anticipated, the Whittle NPV result chart was used to select the pit shell that maximises the open pit value. For combined underground and open pit operations the open pit shell selection criteria also took into consideration the underground mining plans.

1.15.19 Optimisation Results

Open pit optimisation indicated a profitable and feasible open pit mining scenario with a good project value for all deposits.

1.15.20 Ore Reserve Estimate

The ore reserve estimate for the Keliber lithium project was generated by first using a Lerchs-Grossmann open pit optimisation process (Whittle) to identify the most profitable pit shells, which were then adjusted further to account for operational design elements such as ramps, berms, etc.

The Rapasaari and Länttä pits included an underground component to be mined later in the mine life, and the Emmes deposit envisages an underground operation only.

Summaries of the ore reserve estimate for the Keliber lithium project are given in Table 1-10.

Table 1-10: Ore Reserve Estimate

		Syväjärvi		Rapasaari		Länttä		Outovesi		Emmes		Total	
		kt	Li_2O %	kt	Li_2O %	kt	Li_2O %	kt	Li_2O %	kt	Li_2O %	kt	Li_2O %
Open Pit	Proven	734	1.26			164	0.96					**898**	**1.20**
	Probable	1 021	1.12	2 410	1.00	86	0.84	222	1.08			**3 739**	**1.03**
Open Pit Reserve	**Sub-Total**	**1 755**	**1.18**	**2 410**	**1.00**	**250**	**0.92**	**222**	**1.08**	**nil**		**4 637**	**1.07**
Under-ground	Proven					247	0.83					**247**	**0.83**
	Probable			1 081	1.09	580	0.85			863	1.01	**2 524**	**1.01**
Under-ground Reserve	**Sub-Total**	**nil**		**1 081**	**1.09**	**827**	**0.85**	**nil**		**863**	**1.01**	**2 778**	**0.99**
Total Reserve		**1 755**	**1.18**	**3 490**	**1.03**	**1 077**	**0.86**	**222**	**1.08**	**863**	**1.01**	**7 408**	**1.04**

1.16 Mining Methods

1.16.1 Introduction

The following mining methods were evaluated by Pöyry against the Keliber deposits to determine the most suitable mining method:

- Strip mining
- Terrace mining
- Truck and shovel operation
- Underground mining.

Conventional Truck and Shovel was selected as the most suitable mining method for the open pit mining areas. This method involves the use of large, off-highway haulage trucks loaded directly by large shovels or excavators.

The key points of the Conventional Truck and Shovel method are:

- The truck and shovel combination is a known and proven mining technology capable of handling most rock types in Finland
- The haulage and loading equipment can handle both free-dig and blasted material
- Blending of ore from multiple deposits is simple compared to other mining methods
- The ability to produce the total annual mining rates anticipated (6 Mtpa total material, 600 ktpa ore)

The main underground mining method is bench and fill mining and is appropriate for this style of deposit with the ore body being accessed from the decline. Mining will advance from bottom upwards in 20 m high mining lifts and back fill will be waste rock from the open pit and development drives.

1.16.2 Pit Slope Geotechnical Evaluation

The geotechnical conditions in all pits are considered to be very good. The intact rock strength is medium to high and rock quality is good. Considering the small size of the open pits this generally means that possible slope failures are mostly structurally dominated small scale bench failures. Therefore, kinematic analyses are used to determine optimal bench, berm and overall slope angles for each open pit.

1.16.3 Pit and Underground Mine Design

The assumptions and methodology used in the open pit design process for the Keliber DFS and the proposed design parameters for all pits are listed and proposed design parameters used to create the final pit designs are detailed.

The geotechnical parameters apart from ramp width required for the pit design were obtained from the Pöyry Geotechnical Study. The ramp width has been calculated using 2.5 times the width of the overall haul truck width. The haul truck used for the design was the Caterpillar 777, which has an overall width of 6.4 m. A 16 m ramp width is used for all pits except for Outovesi, which is a small scale operation so a narrower ramp can be used. The 16 m ramp allows for drain ditches and safety berms to be constructed. The final benches in the pit designs have been designed using single lane access which allows the retrieval of extra ore at the base of the pits.

Design of the underground mines provides details of the declines (location, gradient etc) and the raises needed for ventilation and backfill.

Recommended parameters for open pit designs and layouts for each deposit together with the underground layouts are provided.

1.16.4 Production Schedule

The mine production schedule for the Keliber Project used the pit designs and reserves from the pit designs to achieve:

- 11 000 tpa Li_2CO_3 production
- Feed highest quality ore at the start of the schedule
- Minimise initial waste stripping
- No haulage was modelled
- No waste dumps were modelled.

The production schedule has been developed on an annual basis. The recommended mining sequence is as follows:

1) Syväjärvi.
2) Rapasaari Open Pit.
3) Länttä Open Pit.
4) Länttä Underground.

5) Emmes.

6) Rapasaari Underground.

7) Outovesi.

1.16.5 Total Material Movements

Ore movements by open pit and underground mines are shown in Figure 1-7. There are sufficient Ore Reserves for 13 years of stable production although the first and last years are executed with a lower production rate due to run-up and run-down phases of the mining operations.

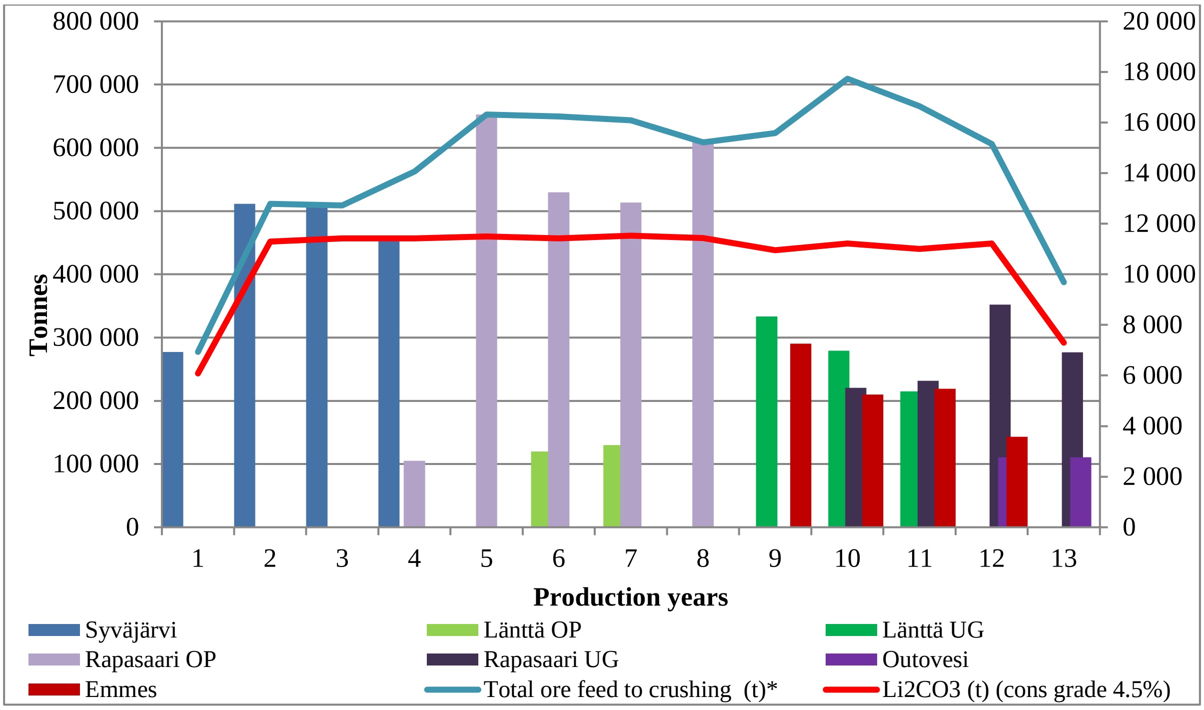

Figure 1-7: Annual Ore Production

1.17 Recovery Methods

1.17.1 Overview of the Treatment Route to Produce Lithium Carbonate

The treatment route to produce lithium carbonate from spodumene is based on extensive test work, which was started in 2015 and undertaken, mainly, by GTK Mintec, Outotec and Metso. The selected overall flowsheet comprises a conventional spodumene concentrator, conversion of alpha to beta spodumene in a rotary kiln and a soda pressure leach process to produce lithium carbonate. A simplified process block flow diagram is given in Figure 1-8.

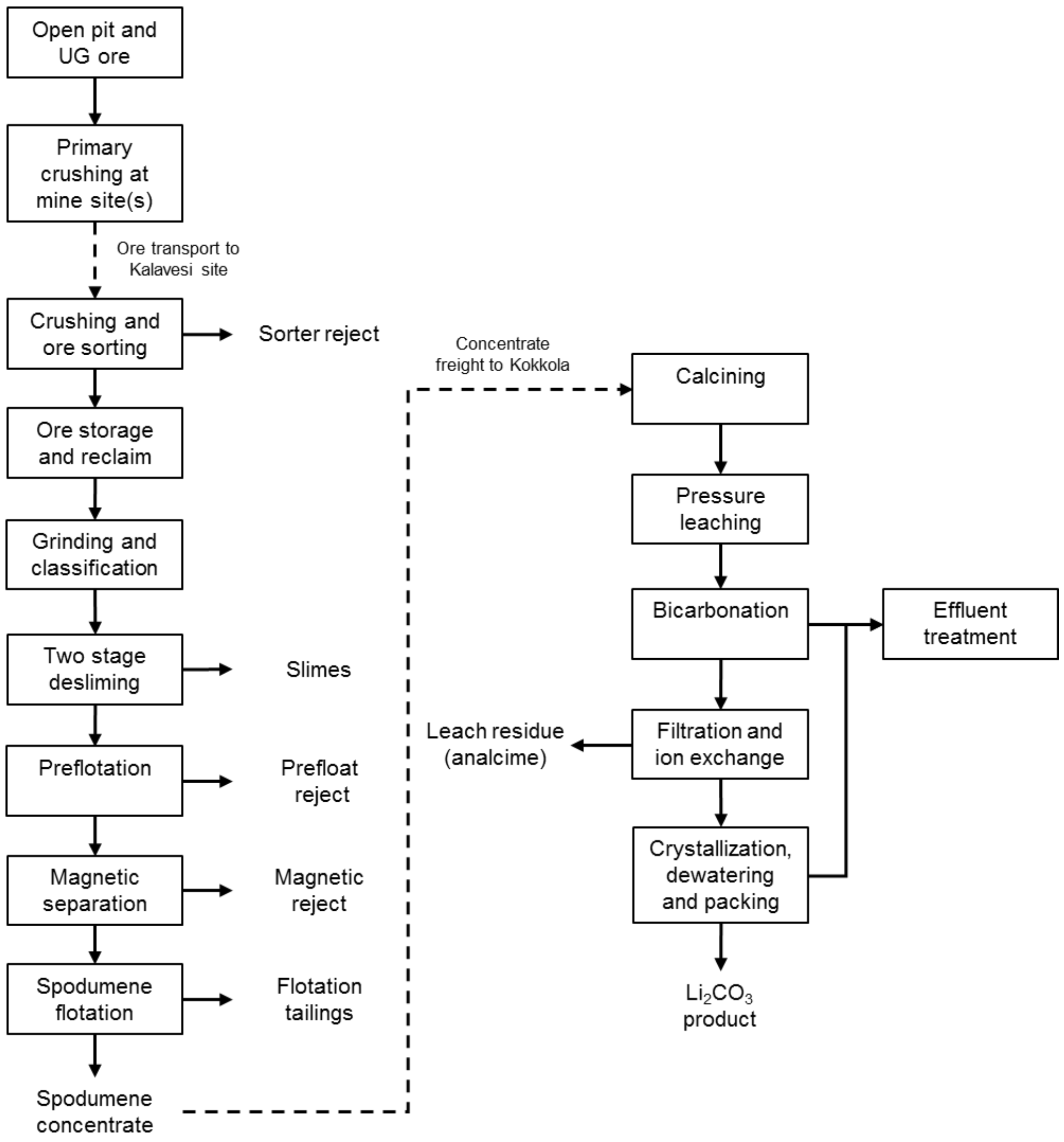

Figure 1-8: Simplified overall process block flow diagram to produce lithium carbonate

The process flowsheets developed are based on unit operations that are proven in the mineral processing and chemical industries, although the soda pressure leach process (in continuous mode) is not yet in commercial operation. However, the overall process has been proven at pilot plant scale.

The key criteria for the Project are:

- The plant is designed for a nominal ore throughput of 600 000 tpa and a design value of 650 000 tpa
- The annual lithium carbonate production rate will be 11 000 tonnes at the selected nominal throughput rate
- Head grade of the spodumene ore will be 1.04 Li_2O% over the life of mine

- Target Li_2O content of the spodumene concentrate is 4.5% and 99.5% Li_2CO_3 of the final product
- Availability of the minerals processing plant will be 91.3% and lithium carbonate plant 85.6%
- A high level of automation will be utilised considering the relative complexity of the flowsheet
- Equipment will be selected for reliable operation and ease of maintenance
- Layout engineering will be to ensure easy access to all equipment for operation and maintenance purposes with a compact footprint to minimise construction costs.

1.17.2 Recoveries in the Lithium Carbonate Production Process

The typical lithium recovery figures for the different stages in the production of lithium carbonate are summarised in Table 1-11.

Table 1-11: Recovery figures in the lithium carbonate production

Area	Concentrate grade%	Recovery%	Basis
Minerals Processing	4.5%Li_2O% 2.09%Li	87.3%	Flotation test work in laboratory and pilot scale. Recovery varies by deposit and this is a typical average value
Conversion	4.5%Li_2O 2.09%Li	>95.0%	Metso Minerals pilot test 2017
Leaching yield	4.5%Li_2O 2.09%Li	89.0%	Average value from Outotec test work 2017
From concentrate to Li_2CO_3 product		83.9%	Outotec engineering estimate
Overall recovery from ore to Li_2CO_3 product		73.2%	Average calculated value. Varies from one deposit to another due to differences in recovery in mineral processing

1.17.3 Overall Mass Balance

Table 1-12 gives the average annual overall mass balance of the plants from the ROM to the lithium carbonate.

Table 1-12: Average Annual Overall Mass Balances

Stream	Dry flowrate tonnes per annum	Li_2O%	Lithium distribution %
Run of mine (ROM)	600 000	1.03	100.0
Sorter reject	98 800	0.00	0.0
Grinding feed	501 200	1.23	100.0
Slimes	43 500	1.06	7.5
Prefloat feed	457 700	1.25	92.5
Prefloat reject	2 200	1.38	0.5
Magnetic reject	750	0.571	0.1
Spodumene flotation feed	454 750	1.250	92.0
Spodumene flotation tailings	334 900	0.09	4.7
Spodumene concentrate	119 850	4.50	87.3
Feed to leaching	119 850	4.50	87.3
Analcime sand and effluents	142 000	-	14.1
Li_2CO3 (Battery Grade 99.5%)	11 240	40.24	73.2

1.17.4 Spodumene Concentrator

1.17.4.1 Introduction

The spodumene concentrator at Kalavesi is designed to produce a flotation concentrate containing 4.5% Li_2O for the downstream lithium carbonate production process. In the production phase the lithium oxide grade of the concentrate will be a process optimisation point therefore the test work and design have covered the concentrate grade range from 4.5 to 6.0% Li_2O. With the assumed lithium carbonate prices, a 4.5% concentrate is considered the most feasible solution.

Concentrate will be de-watered and filtered to have an average moisture content of 10%. De-watered spodumene concentrate will be conveyed to flotation concentrate storage and loaded into trucks by front-end loader for transport to the Kokkola site. A simplified block flow diagram for the concentrator is shown in Figure 1-9.

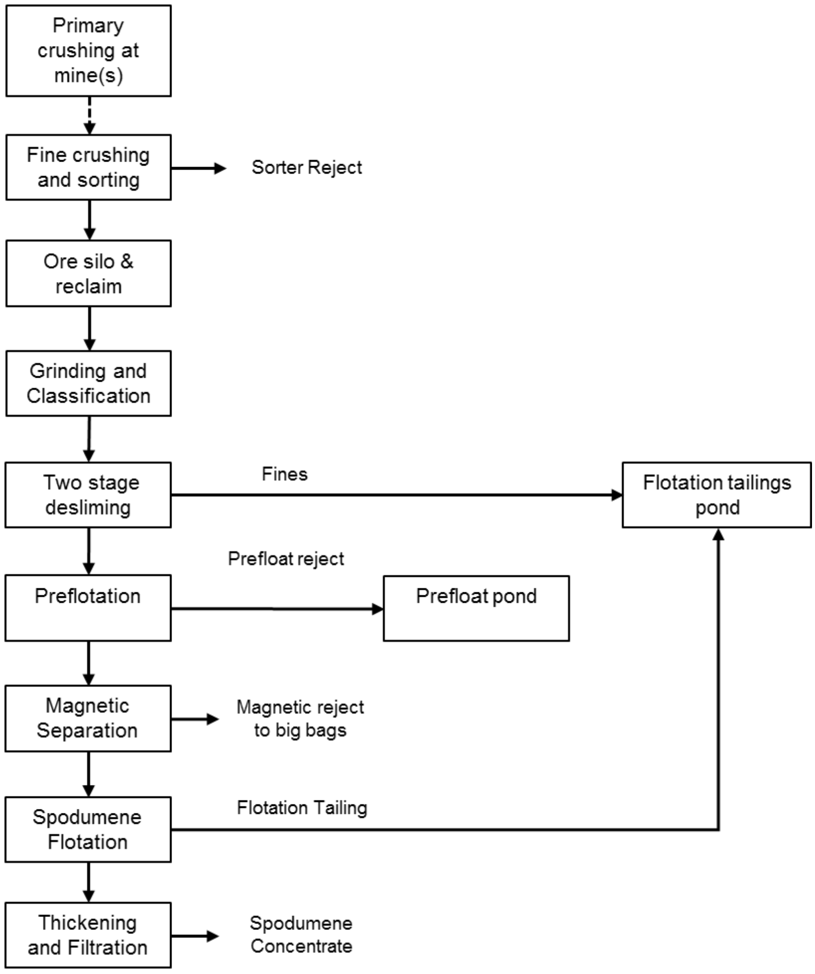

Figure 1-9: Simplified Block Flow Diagram of Spodumene Concentrator

1.17.4.2 Process Design Criteria

The process design criteria for the whole operations are based on a nominal production rate of 11 000 tpa lithium carbonate final product. On this basis the concentrator processing rate equals 75 tph ore nominal input equalling 600 000 tpa based on 8 000 hours annual operating time (91.3% availability).

1.17.4.3 Flow Sheet and Process Description

Primary crushing will be at the mine site using a mobile crushing unit. The primary crushed ore will be stockpiled for loading and transported to the ROM ore stockpile at the concentrator. The ROM ore stockpile and homogenisation area will be sufficient for ore blending and will provide a minimum capacity of around two weeks' buffer for the mill production.

The concentrator crushing and sorting plant comprises screening, secondary and tertiary crushing with fine and coarse ore sorting.

A two-stage rod-ball mill grinding circuit was selected with the rod mill operating in open circuit and the ball mill in closed circuit with wet screening. Oversize from the wet screening will be returned to the ball mill and undersize will be pumped to de-sliming cyclones. Cyclone overflow is pumped to the tailings facility and the cyclone underflow is pumped to the flotation circuit.

Typically, the spodumene flotation is expected to recover 83% of the Li_2O into a flotation concentrate representing around 26% of the ore mass. The recovery will vary depending on the deposit, the head grade and mass proportion of wall rock dilution (country rock). The concentrate grade can vary between 4.5% and 6.0% and this is to be optimised during operations.

1.17.4.4 Spodumene Concentrate Storage

The concenrate storage facility will provide sufficient storage for two days operation, providing a buffer between the concentrator and conversion plant. Spodumene concentrate will be loaded by a front-end loader and transported by truck to the KIP site.

1.17.4.5 Future Expansion

The concentrator has been designed to be able to treat up to 650 000 tpa of ore and the layout of the plant allows for later installation of dense media separation and gravity concentration circuits, if required.

1.17.4.6 Reagents and Consumables

Adequate stocks of reagents and consumables for the concentrator will be maintained on site to ensure that the production at the concentrator is not disrupted.

1.17.5 Kalavesi Site Services

The main site services required are power, water and air. Electric power will be supplied by Korpelan Voima Oy, a local grid company which is operating the power distribution in the area.

Raw water will be pumped from Vissavesi lake located at a distance of 2.5 km and treated on site to provide the required process and sealing water. Potable water will be taken from the municipality water supply.

Fire water will be sourced from the fresh water pond and the process circulating water pond and pumped through a ring pipeline with fire hydrants.

There will be a waste water treatment plant comprising facilities for clarification and pH control to treat all water from the concentrator prior to being discharged

A compressor station will be sited at the concentrator to provide compressed air for general use and for instrument air. Air for the flotation plant will be supplied by two dedicated air blowers.

1.17.6 Tailings and Water Management at Kalavesi Site

At Kalavesi the tailings will be stored in two different ponds located close to the concentrator. The fines and spodumene flotation tailings are stored together in the flotation tailings pond and the pre-float reject in the pre-float pond. In addition there will be one water pond for storing fresh water and the process circulating water. The tailings do not need any chemical treatment.

The flotation tailing pond will be built in two or more stages. The starter dam with three years capacity will be built with moraine. After that the dams will be raised with the coarse spodumene flotation tailing. The total area of the dam will be 46 ha. The pre-float pond with and area of 6 hectares will be lined with geomembrane and the sealing structure contains bentonite mat and a HDPE/LLDPE-liner.

The overall water balance of the Kalavesi plant area has been calculated with HSC Chemistry Simulation software. A water management concept has been developed together with the process designers and the environmental specialists. The water balance model is based on preliminary process design information for the production plants, for the tailings area, and for the fresh water treatment and power plant areas. Additional sources of information include laboratory test and pilot plant test reports.

This water balance model has been used to define the quantity of fresh water needed. Production processes define the requirements of process water, which are produced at the fresh water treatment plant. The fresh water treatment plant produces chemically purified water (low organic content and low solid content). Chemically purified water is also used as make-up water for the closed cooling water circuit, and as sealing water. Discharge waters from the fresh water treatment plant are treated at the urban waste water treatment plant.

The water circulation concept has been defined together with the process designers. The concentrator's water recirculation rate is high (about 90%), and chemically treated water is needed only at a few consumption points.

Due to fresh water intake and due to the large tailings pond surface areas, which receive rain water, there is a need to release extra water to the environment from the minerals-pond water balance area. Water quality has been analysed for concentrator process pilot samples, and solubility tests have been performed for solid residues of the process. Based on these results, and the simulation, the effluent is expected to contain mainly sodium and sulphate. In addition, traces of other compounds can be found in the effluent.

This water is treated in a pH adjustment and clarification process. The tailings pond and the water recirculation pond serve as buffer ponds, they ensure the availability of recirculated water for the concentrator, and they can also be used to balance the effluent flowrate to the receiving waters. There are seasonal variations in precipitation and natural evaporation, and these variations will have an influence on pond water inventories and/or the effluent flowrate.

Drainage waters will be segregated from process waters to prevent accumulation of water to the process water circuit.

1.17.7 Lithium Carbonate Production Plant

1.17.7.1 Introduction

Spodumene concentrate will be delivered by truck from Kalavesi and discharged at the concentrate storage facility which has capacity sufficient for three days of operation.

1.17.7.2 Process Design Criteria

Metso and Outotec have developed the process design criteria for the Conversion Plant and the Hydrometallurgical Plant, respectively, for a nominal production of 11 000 tpa of lithium carbonate final product. This level of production requires a feed of about 135 000 tpa of wet spodumene concentrate (10% moisture and 4.5% Li_2O) to the Conversion Plant based on the overall Chemical Plant operating 7 500 hrs pa (85.6% availability).

1.17.7.3 *Flow Sheet and Process Description*

A simplified block flow diagram for the Chemical Plant is given in Figure 1-10.

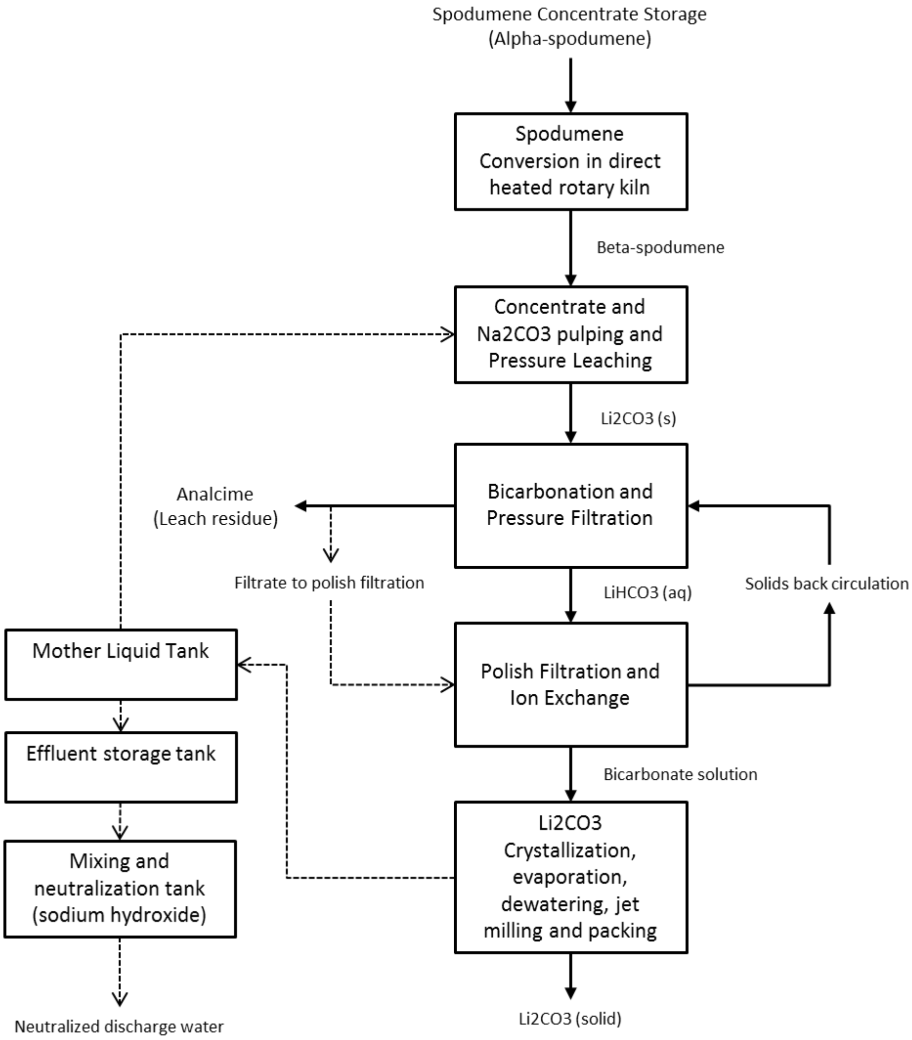

Figure 1-10: Simplified Block Flow Diagram for the Chemical Plant

1.17.7.4 *Reagents and Consumables*

The consumables and reagents for the lithium carbonate plant include:

- Water – process and de-mineralised water
- Steam – high and mid pressure steam
- Flocculant
- Sodium carbonate
- Calcium hydroxide
- Magnesium hydroxide
- Sodium hydroxide
- Sulphuric acid
- Carbon dioxide.

Sufficient stocks of reagents will be maintained on site to ensure that any supply interruptions do not impact production.

1.17.8 KIP Site Services

Many of the required site services, for example security and fire brigade, are available at the KIP site and existing infrastructure is available to supply these.

1.18 Project Infrastructure

The major infrastructure for the project comprises the following items:

- **Mines** (Länttä, Rapasaari, Syväjärvi, Outovesi and Emmes):
  - The access roads from the mines to the concentrator
  - 20 kV power transmission lines to mine sites: Länttä (200 m), Rapasaari (3.4 km), Syväjärvi 3.3 km, Outovesi (3.4 km) and Emmes (200 m)
  - Mobile crushing unit
- **Concentrator** (Kalavesi):
  - Raw water pumping station at Vissavesi, piping and water treatment plant
  - 2x 20 kV power transmission lines from the supplier substation to Kalavesi site (4.8 km long)
  - Required infrastructure for the concentrator and equipment:
    - crushed ore pile
    - screening
    - secondary crusher, sorting and tertiary crusher
    - conveyors and ore silo
    - grinding, flotation and dewatering
    - concentrate storage
  - Tailing ponds: Two tailing ponds process residues and one water pond
  - Small power plant to produce heat
- **Chemical Plant** (KIP):
  - Required infrastructure for conversion and hydrometallurgical plant and equipment:
    - concentrate storage
    - conversion plant
    - hydrometallurgical plant
  - Effluent treatment plant
  - Liquefied petroleum gas (LPG) storage and handling facilities

- **Auxiliary facilities all at sites:**
  - Main switch station and electricity distribution at each site
  - Main gate, area fencing and weighbridges
  - Pipe bridges for pipelines
  - Office, laboratory and service / storage facilities.

1.19 Market Studies and Contracts

To evaluate the market for its product Keliber commissioned the Roskill Consulting Group Ltd. (Roskill) to undertake a lithium market overview and outlook study. Roskill provided its updated report in April 2018, which describes the supply of lithium by current producers as well the potential new suppliers. It also analyses lithium demand by applications, with a special focus on the use of lithium in rechargeable batteries. Historic prices for lithium carbonate and the forecast price to the year 2032 for both for technical and battery grade lithium carbonate are also provided.

1.19.1 Global Lithium Reserves and Resources

In 2018, the USGS reported global lithium reserves to be 16 Mt Li (85 Mt LCE). The USGS also reported lithium resources at 53 Mt Li (282 Mt LCE), with continental brine resources accounting for 60% of the total resources.

1.19.2 Lithium Supply and Outlook of Mine Production Capacity

Since 2000, growth in mine output has averaged 10% py; in 2017 the production of lithium totalled 360 256 t LCE. In 2017 the global mine capacity totalled nearly 375 000 LCE, this is forecast to increase to 950 000 tpy by 2022 and to 1.15 Mtpy by 2027.

Despite projects, expanded and under development, significant volumes of additional capacity will be required by the mid-2020s to match demand growth later in the decade and into the 2030s.

1.19.3 Current and Historical Lithium Consumption

Growth in consumption has been led by increased use of lithium by the rechargeable battery industry, growing at 19.3% py between 2000 and 2017. The rechargeable battery sector accounted for 45% of lithium consumption in 2017.

Lithium carbonate is the most widely consumed product, finding application in rechargeable batteries, ceramics, glass-ceramics, glass, metallurgical powders, aluminium and other uses. Battery-grade lithium carbonate demand has increased by 22.0% py since 2011.

Battery-grade carbonate and hydroxide together represented 44% of total consumption by product in 2017, reflecting the share of the rechargeable battery market in the overall lithium market.

China is the largest consumer of lithium, accounting for around 40% of total consumption in 2017 followed by Japan and South Korea at 19% and 14% of the global market for lithium respectively. Both Europe and North America are mature markets for lithium with growth stagnating since the early 2010s. India, Russia and the CIS remain relatively small markets.

1.19.4 Lithium Consumption Outlook 2017 – 2032

The short, medium and long-term outlook for lithium consumption appears strong, with overall growth forecast at 14.7% py to 2027. The market is forecast to reach over 831 600 t LCE in 2027, 1 Mt LCE in 2029 and 1.5 Mt LCE in 2032. The consumption of lithium will continue to be driven by the rechargeable battery sector, which is forecast to register 19.6% py growth through to 2032, reaching around 1.4 Mt LCE.

Corresponding with the growth in rechargeable battery lithium consumption, battery-grade lithium carbonate and hydroxide demand could increase by 14.6% py and 28.9% py respectively through to 2027 and from 2027 – 2032 to reach almost 600 000 t LCE and 785 000 t LCE respectively.

The rechargeable battery sector is largely Asia-based in terms of intermediates, so Asia, in particular China, Korea and Japan, are expected to show the strongest gains in lithium consumption to 2032.

1.19.5 Market Balance: Outlook of Supply Demand Balance

Roskill's base-case forecast projects lithium consumption increasing by 13.1% py through 2032 to reach just over 1.556 Mt LCE, a seven-fold increase, in 2017.

Mineral concentrate production is expected to exceed refined lithium demand and the needs of converters in the short-term, which after a period of stockpiling will mean some rationalisation of mineral capacity and/or supply in 2019/20. Beyond 2021, strong demand growth is expected to support additional requirements for mine supply at mineral operations.

Lithium carbonate and lithium hydroxide supply are expected to keep pace with demand. Although there is likely to be a temporary oversupply of lithium hydroxide around 2019 an oversupply of lithium carbonate is not expected. Brine-based carbonate production might increase in the early 2020s, but the ramp-up of brine assets has proven slow and a sudden surge in output is not expected.

1.19.6 Lithium Prices

Lithium product prices respond to variations in supply, demand, and the perceived supply/demand balance, costs and economic factors in a similar way to most other raw materials. The three most commonly sold finished products are lithium carbonate, lithium hydroxide, and mineral concentrate. Transactions are negotiated between the producer (or agent / trader) and the consumer to suit individual circumstances. Lithium is not traded on any exchange.

The Keliber Project is to produce and sell battery grade lithium carbonate although some technical grade may be produced from time to time. Technical and battery grade lithium carbonate are priced differently.

Spot prices for battery-grade lithium carbonate (>99.5% Li_2CO_3) in China appear to command a premium to technical-grade (>99.0% Li_2CO_3). However, there have been years when battery-grade has been sold at a discount to technical-grade carbonate.

Technical-grade lithium carbonate contract prices are expected to follow the trend of battery-grade. Average annual prices are forecast to rise to US$15 000/t by 2025 and

US$20 000/t by 2032, although there is expected to be a weakening in prices in the period 2019 - 2022.

Battery-grade lithium carbonate commands a slightly higher price to technical-grade, typically around US$500-1 000/t CIF, reflecting the purification and/or micronizing steps involved for most producers. However, this is not always the case.

US$12 000/t is expected to be the new floor for average annual contract prices, which assumes demand continues to grow at high rates necessitating incentives for capacity build-out and higher-cost supply. The nominal price for battery-grade lithium carbonate is forecast to be USD11 000/t in 2020 rising to USD19 000/t in 2032.

1.19.7 By-Product Markets

Keliber will obtain two by-products, namely analcime sand and quartz-feldspar sand, which could potentially have a commercial value. Potentially analcime sand could be used as a construction material, as a land fill material at the Port of Kokkola and in water treatment.

Test work related to the use of the quartz-feldspar sand as filler material in concrete, mortar, plaster and asphalt has been carried out and as raw material in foam glass and geopolymer brick production.

The potential for using crushed and sized waste rock as aggregate in construction is also being pursued.

No revenues from sale of by-products have been assumed in the DFS financial analysis.

1.19.8 Contracts

Keliber has initiated negotiations with a number of regional and global operators in the lithium supply chain in both the battery and non-battery sectors. Strong interest has been registered for Keliber's product partly driven by the European location of the Project. The release of the DFS will provide the basis for the next stage of offtake negotiations.

Keliber have also signed a Letter of Intent ("LOI") with an international chemicals producer with a focus on lithium chemicals. The parties intend to establish a technical and commercial cooperation to evaluate product and marketing strategies for lithium products based on Keliber's planned production.

In addition, Keliber has a number of Letters of Intent relating to process by-products namely analcime sand, feldspar-quartz sand and waste rock aggregates. These may provide potentially additional revenue in the future.

1.20 Environmental Studies, Permitting and Social or Community Impact

1.20.1 EIA and Permitting Requirements

Under Finnish legislation, mining permits will be required for all phases of project development (prospecting, commissioning, production and closure and rehabilitation), supported by an Environmental Impact Assessment (EIA) that is part of the statutory process. The EIA process includes program and reporting phases. Keliber has three different EIA processes and their status are:

- For the mining areas, the EIA of the Central Ostrobothnian Lithium province: program commenced in 2014 and the EIA report was submitted to ELY Centre in March 2018.
- The EIA of the Kalavesi Concentrator Plant EIA program commenced in 2016 and the EIA report was submitted to ELY Centre in March 2018.
- The EIA of the Kokkola Lithium Chemical Plant commenced in 2017 and the EIA program was submitted to ELY Centre in April 2018; the EIA report is in preparation.

The relevant authority has not yet provided its statement on the EIA reports and the EIAs have still to be approved.

Finnish authorities have applied with Keliber a pre-negotiation procedure in the EIA and permitting process. Related to that more than 10 meetings have been held between Keliber and different authorities by June 2018 Keliber is the first mining company receiving this status in Finland.

1.20.2 Environmental and Social Aspects

Mining areas are located away from the settlements of Kaustinen and Kokkola in forested areas that are of low to moderate environmental sensitivity. The mining area is within the catchment area of the Perhonjoki River which is a significant fish habitat. Vionneva Natura area, the nearest important Bird Area, is located in the vicinity; a Natura Assessment concluded that the project would not adversely affect the reserve. There are no areas of special protection status, as defined in the Nature Protection Act or the Water Act. The mines are located in the core area of the Suomenselkä population of Finnish forest reindeer (*Rangefer tarandus fennicus*) and are a habitat for the brown bear, otter, Siberian flying squirrel, the Northern bat, as well as the Moor frog which are protected species under Finnish legislation.

The mines are located in sparsely-settled areas with few recreational facilities or permanently occupied properties. Noise generated by mining activities is not expected to exceed the guideline value set by Government Decision 993/1992 in any of the residential buildings and holiday homes around the mine areas. Modelling of noise generated by transport activities indicates exceedance of the guideline value (55 dB) in a total of nine residential buildings (currently seven) and exceedance of the guideline value (45 dB) in a total of six holiday home buildings Vibration impacts caused by blasting on properties and the residents of the neighbouring area are expected to be negligible; and impacts arising from dust emission (PM10) are considered minimal due to the distance of the mines from residential properties.

The overall sensitivity of the receiving environment is low to moderate and no significant adverse impacts have been identified. Standard mitigation measures will be required.

The **Concentrator** will be located near Kaustinen in an area which is mainly forested. A former landfill site and main road 63 area located to the south of the site. There are no valuable or protected soil and bedrock. There are no important groundwater areas suitable for water supply purposes in the project area nor its immediate vicinity. The project area in its entirety is located within the Perhonjoki main water system (no. 49, 2 524 km^2). The waters of the wetlands in the project area flow mainly through the same waterways as the lake waters. Vissavesi artificial lake, located approximately 1000 m south of the project area is a regulated lake. The biological characteristics of the Kaustinen region are primarily that of the mid-boreal zone, typically dominated by pine forests. Other abundant species include the bilberry, crowberry and wavy hair-grass. The most abundant species on the forest floor are the red-stemmed weather moss, glittering wood moss and rugose fork-moss. Construction of the plant will lead to removal of a certain area of these biotypes however the impact is considered to be negligible.

Of the local fauna, the most notable species include the Moor frog. Surveys have been undertaken in areas that are classified as moor frog breeding and resting sites. The overall impact of the project on the moor frog is considered negligible. Impacts on bat species range from negligible to moderate, given that no breeding or resting sites for bats were identified. With the exception of the riversides of the watercourses, the investigation area contains no habitats suitable for the Siberian Flying Squirrel (*Pteromys Volans*). Several otter tracks were observed but the watercourse impacts in these areas are not significant for the occurrence of the species. Avifauna in the area is typical of coniferous forests in Finland. Most of the species, with the exception of the common crane, also nest in the area or its immediate vicinity. The overall impacts on bird populations are estimated to be negligible. Fish stock in Köyhäjoki river has been classified as fairly poor. Impacts on fish stock and other watercourse populations are primarily due to changes in water quality, however, impacts generated by plant operations are not expected to significantly impact water quality. There are no nature conservation areas in the immediate vicinity of the Kalavesi concentrator. There are no protected areas in the project's impact area, and the sensitivity is considered low.

The nearest permanent settlement is located at the western edge of the project area, in the village of Kalavesi. and the nearest residential building is a holiday home located at Mustalampi beach, approximately 500 m north of the concentrator. Fur farming activity occurs near the project area. There are no official parks in the local area but a nature trail is located on the western side of the Syväjärvi. It is estimated that heavy traffic to and from the project area will use the main road 63 (Kauhava–Ylivieska) and Highway 13 (Kokkola–Nuijamaa). Traffic impacts on Highway 13 are estimated to be minimal. No significant noise or vibration-causing permanent activities are present in the project area, other than that from traffic on the main road. The project area is sparsely-populated and apart from a historical landfill waste dump there are no other sources of air emissions. The sensitivity of the project area to mining activities is estimated to be moderate since the air quality in the area is good and there are scattered settlements along the transport routes. However, there are no sensitive sites in the impact area, such as schools.

The overall sensitivity of the receiving environment is low to moderate due to the absence of sensitive receptors and no significant adverse impacts have been identified. Standard mitigation measures will be required, particularly for air quality and noise which may affect certain residences along the road.

The **Chemical Plant** will be located in the Kokkola Industrial Park (KIP) in the harbour area, where there are other industrial activities and the area is zoned for chemical industry. Two classified groundwater areas are present: Patamäki (groundwater area number 1027251) and Harrinniemi (1027202). Three water intake stations are located in the groundwater area: Patamäki, Saarikangas and Galgåsen. The Harrinniemi groundwater area is classified as suitable for water abstraction (Grade II groundwater area). Kokkola belongs to the transient zone, or ecotone, between the central and southern boreal areas. Its location near the coastline, as well as the post-glacial rebound is reflected in the vegetation of the area. The forest type is dry *taiga* with no protected biodiversity sites. The area is industrialised and not a suitable habitat for endangered species or species mentioned in the Habitats Directive (Annexes II and/or IV). The value of the site, in terms of avifauna has been assessed as “low in importance”.

Diverse fishing takes place in the sea off the city of Kokkola. The most significant target species are whitefish, perch and pike. The nature conservation area nearest to the project area in KIP is the Rummelö-Harrbåda Natura area (FI1000003), which is classified as a protection area (SPA) and located 2.2km from the plant site. The area covers 236 ha. In addition, the area is included in the national wetland protection programme. The nature conservation area is located approximately 2.2 km north of the project area. The Harrbåda-Rummelö area is also part of a nature conservation area established by the City of Kokkola and, as an important breeding and feeding ground for many birds. It is also included in the national wetland protection programme.

The site is located within an industrial area (Kokkola Industrial Park (KIP)) with several other industrial plants, including Neste Corporation’s Kokkola terminal and Kokkolan Energia Oy’s power plant. A rail yard and the Kemirantie road are located on the remaining boundaries of the project area. The nearest residential area is Ykspihlaja, approximately 1 km from the site. In the northern part of the residential area of Ykspihlaja there are several sports fields. In addition, there is the Potti marina. To the north of the project area there are oil tanks. In the project area, or in its immediate vicinity, there are no ancient monuments, nationally or provincially valuable landscape areas or valuable built-up cultural environments.

Land uses in the surrounding area are limited to a kindergarten, a church and sports fields. In addition, there is the Potti marina and a beach. A number of recreational facilities are present in the area. The route between the Kalevesi concentrator in Kaustinen to the hydrometallurgical plant in Kokkola is via the Toholammintie road (main road 63). The Port Tower in Satamatie serves as a point of entry for shipments and workers to the industrial area. Noise generated by industrial activities in Ykspihlaja is largely confined within the industrial area. The noise from the industrial activity in the area does not exceed the reference values in the residential area. According to the study, the average levels of daytime noise in the project area vary from 45 to 55 dB. Vibration in the Ykspihlaja area is mainly caused by rail traffic and, to a lesser extent, road traffic. Industrial emissions in Ykspihlaja, Kokkola have been reduced significantly since the mid-20th century. The biggest source of air emissions in the city centre comes from the nitrogen oxide and particulate emissions from road transport. Problems arising from airborne particles are most evident in the spring when the streets dry up and the street dust rises in the air due to traffic and wind. Air quality is monitored in Kokkola at two metering stations, one in Pitkänsillankatu street in the city centre and the other in Ykspihlaja. The metering stations continuously measure concentrations of sulphur dioxide

(SO_2), respirable particulate matter (PM_{10}), fine particulates ($PM_{2.5}$), and nitrogen oxides (NO_x, NO and NO_2).

The overall sensitivity of the receiving environment is low to moderate due to the industrial setting and no significant adverse impacts have been identified. Standard mitigation measures will be required.

1.20.3 Environmental and Social Impacts

Based on the EIA report there are no significant adverse impacts associated with the mines. Impacts are related to surface waters and fish population (nitrogen load), vegetation inside the mine area, moor frogs, avifauna, Vionneva Natura area and close to mine areas and traffic related effects (dust, noise, vibrations, landscape, safety), which were assessed negligible to minor only. Monitoring programs for surface and ground waters, dust emissions, noise and vibrations will be developed during the environmental permitting process.

From the processing side, analcime sand will be formed; a permit for transport and disposal will be required in accordance with Finnish legislation. No major adverse impacts have been identified.

Based on the EIA report there are no major adverse impacts associated with the concentrator plant. The main impacts relate to surface waters and fish populations, moor frogs, golden eagle and bats, which were assessed as negligible to minor. The total water discharge rate is approximately 70 m^3/h. Monitoring programs for surface and ground waters, dust emissions, noise and fish population monitoring will be developed during the environmental permitting process.

1.20.4 Community Consultation and Information Dissemination

The public and stakeholder consultation process has been active since 2014 and is an on-going process; the Social Impact Assessment (SIA) of Keliber mining operations was conducted in December 2015 and included a questionnaire issued to all land owners and inhabitants near the mine sites and ore transportation roads. Responses indicate that the majority (60%) support the project as presented or with some changes; 27% of respondents opposed the mining project and the remainder (14%) indicated that mining project was of no significance.

The EIA process for the concentrator is finished and consultation was carried out during the process. For the hydrometallurgical plant, the relevant authority has not yet provided its statement on the EIA programme. and further consultation will be done during the environmental application process.

1.20.5 Closure, Reclamation and Monitoring

A closure plan will be drawn up for each mine site. For some sites, the required aftercare and closure measures are defined in the mining or environmental legislation. For other areas, the principles of best available technology or best practices will be applied. In particular, plans for water treatment at mine pits using passive, low cost methods that do not require significant monitoring or maintenance will be prepared.

A closure plan will be prepared for the concentrator and the pond areas during the environmental permitting phase. A waste management plan for extractive waste will be drafted. Post closure, the production site will be used for other industrial activity, and/or the buildings and installations will be dismantled.

Once the operations at the hydrometallurgical plant cease, the plant area will be used for other industrial uses. If necessary, the installations and buildings will be dismantled. A soil and groundwater survey will be carried out in the area and any contaminated areas will be cleaned and brought to a non-hazardous state in accordance with Finnish legislation.

At the end of the mining operations, the mine areas and processing facilities will be regularly monitored to ensure that the measures, structures, water treatment and drainage systems work as planned.

1.20.6 Environmental and Social Management Plans

Environmental and Social Management Plans will be drafted to achieve compliance with established best international practice as per the IFC Performance Standards on Environmental and Social Sustainability (2012) and the Equator Principles III for Environmental and Social Management Systems.

These include an Environmental and Social Management System (ESMS), including a Stakeholder Engagement Plan, and Environmental Management Plan, an emergency plan and safety report to be prepared and delivered to the Safety Technology Authority (TUKES) and environmental permit for the mines and processing facilities at various stages of the project.

1.21 Capital and Operating Costs

1.21.1 Capital Cost Estimate

The capital cost estimate has been prepared based on the input and quotations from the service providers, major equipment and technology suppliers for the Project with Sweco compiling the final cost estimate. Sweco also provided capital cost estimates for some portions of the Project. All costs are presented in Euros based on 2nd quarter 2018. However, the Metso conversion plant equipment supply was quoted in USD and this has been converted to Euros. The accuracy of the capital cost estimate, given the current state of design and procurement, is expected to be within ±15% of final project cost and is therefore in line with AACE Class 3 estimates.

The capital cost estimate is broken down into direct and indirect costs with the direct costs comprising the main areas of the Project and the general services which are common to many areas. The mining cost estimate is relatively low because mining is to be contracted out so there is no mining fleet included. Indirect costs include EPCM fees, Owners’ costs and contingency.

Closure costs are provided but these are not included in the up-front project development capital cost estimate. Closure costs are estimated to be a total of M€11.97.

A summary of the capital cost estimate for the project development is provided in Table 1-13.

Table 1-13: Summary of Capital Cost Estimate

Area	Cost in M€	% of Total Direct Cost
Direct Costs		
General Industrial	20.76	10.2
General industrial Buildings	2.90	1.40
Mine	35.84	18.2
Concentrator	41.12	20.3
Conversion Plant	12.14	6.0
Hydrometallurgical Plant	52.91	24.6
Water Pond	0.80	0.4
Pre-flotation Tailings Pond	2.53	1.2
Tailings Pond	2.30	1.1
Concentrator Building	11.70	5.8
Conversion Plant Building	2.17	1.1
Hydrometallurgical Plant Building	13.60	6.7
Utilities General and Buildings	6.26	3.1
Total Direct Costs	**205,03**	100
Indirect Costs		
EPCM	25.63	
Owners' Costs	6.06	
Contingency	18.45	
Total Indirect Costs	**50.14**	
Total Project Development Capital Cost	**255.17**	

Of the total project development cost of €255M it is estimated that approximately 78% (€199M) is expended in years -1 and 1 with the balance after start of production as indicated in the Figure 1-11.

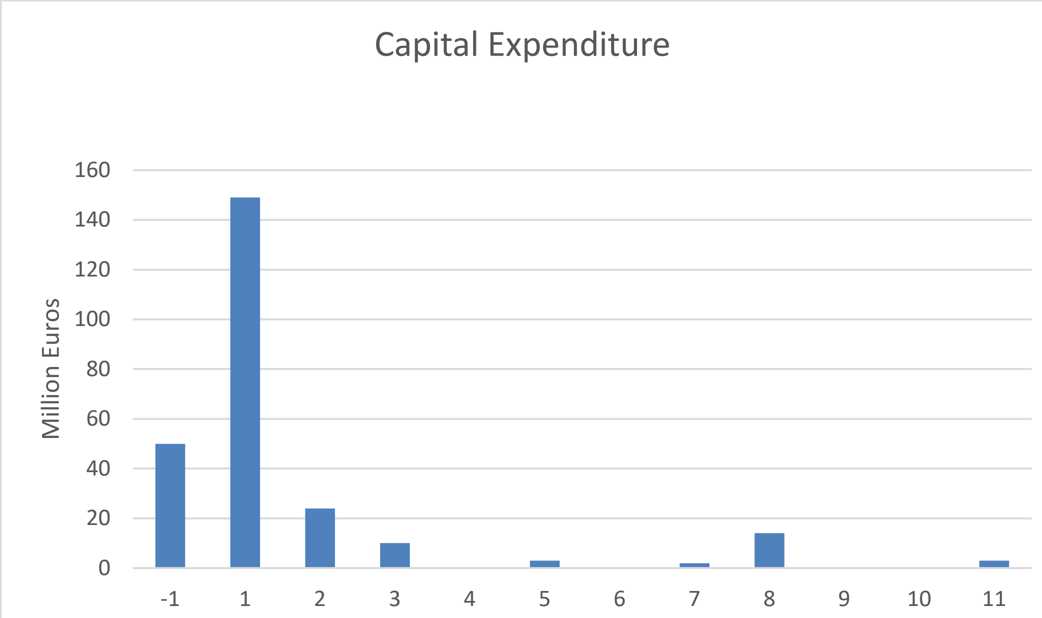

Figure 1-11: Capital Expenditure

1.21.2 Operating Cost Estimate

The operating cost estimate has been prepared by Sweco using consumption rates for power, water, air, steam, reagents etc. derived from operating parameters provided by the technology suppliers and budget prices provided by local companies. Similarly, the cost of services, transport, logistics etc. have been calculated based on offers from local suppliers.

Salaries and costs of personnel are based on average salaries in similar industries in Finland.

A summary of direct operating cost estimate, broken down into the main areas is given in Table 1-14.

These costs are the total costs over the life of the project and exclude permitting costs, landowner payments and royalty payment.

Table 1-14: Summary of Direct Operating Costs

Area	Total Cost over Project Life (MEuro)	Cost per tonne of Ore (in Euro)	Cost per tonne of concentrate (in Euro)	Cost per tonne of lithium Carbonate (in Euro)
Mining	211.4	28.55		984
Concentrating	116.9	15.78	79.15	544
Purchased concentrates	287.5			1 337
Conversion	51.1		24.40	238
Hydrometallurgical plant	304.9		145.50	1 419
Transportation and logistics	17.7		8.44	82
Fixed costs	56.2		26.82	262
Total	**1 045.7**			**4 866**

1.22 Other Relevant Data and Information

1.22.1 Schedule

1.22.1.1 Master Schedule

A preliminary master schedule has been prepared for the execution of the Project, it is planned to have the environmental permits approved in Autumn 2018 after which, when financing is arranged, the project go-a-head decision will be made. It is expected that the project execution phase will be about 21 months. After installation has been completed there will be a period of about 2 months of test runs before continuous production is achieved.

1.22.1.2 Detailed Project Schedule

The most critical activity is the completion of site levelling, earthworks and civil construction at the Kalavesi concentrator site to enable the start of the erection/installation of the mechanical equipment as planned.

Equipment with long delivery times are the autoclaves and evaporators, at approximately 13 months from the date of order. The rotary kiln has a delivery time of approximately 14 months. Installation of the bearing housing for the kiln will be started before arrival of the kiln parts to be able to complete the installation in accordance with the schedule.

1.22.2 Project Execution Plan

1.22.2.1 Introduction

It is assumed that the same group of project parties from the DFS phase will continue with their scope of works in the execution phase. This is to ensure that the knowledge gained is retained for the execution phase.

The principles of the execution plan are the same both for both Kalavesi Concentrator and KIP Chemical Plant. The main difference is that in KIP most of the utilities are available close to the plant compared with Kalavesi where all these must be installed.

1.22.2.2 Objectives

The project can be divided two sections in terms of the execution strategy:

- Section 1: Outotec supply portion, all departments with Outotec equipment but excluding HVAC, building electrification and civil work. Outotec will be responsible for the concentrator and the hydrometallurgical plant. An EP+S contract will be awarded to Outotec for this work which will include:
  - supply of all equipment, piping, process electrification, instrumentation, automation and including also erection
  - erection supervision and
  - commissioning and plant start-up
- Section 2: Balance of plant (BOP) consisting of items not included in Section 1. Conversion plant, power boiler, water and effluent treatment plants, HVAC, civil works and buildings in production plants are included in this section.

1.22.2.3 Approach

An EPCM contractor would be selected to manage the project including project management, procurement, time scheduling, cost control, engineering co-ordination, part of the engineering work and construction management.

1.22.2.4 Engineering

The scope of work for the EPCM contractor would include the engineering work for earthworks, concrete structures, buildings, HVAC, underground piping, building electrification, piping, electrification and instrumentation not included in equipment packages and engineering of utilities.

1.22.2.5 Procurement

Although a large portion of the project procurement activities is included in the Outotec, and Metso packages the portion of the budget for balance of plant is also a significant sum. Close to 50% of this portion is related to civil works and buildings and the remaining 50% is divided mainly into equipment, piping, HVAC and electrical. Procurement activities are planned to be co-ordinated by a procurement engineer.

1.22.2.6 Construction Management

The construction manager will manage the construction and erection activities at site together with his team. This includes quality, safety, cost and schedule management of the works.

Although there may be shared resources at Kalavesi and KIP construction sites it will be necessary to have a construction manager at each site.

1.22.2.7 Contracting

Project activities will be grouped into defined purchase packages. The target is that the purchase packages are such that medium size contractors would also be able to participate in the bidding process. Potential bidders will be selected from EU countries which are qualitied to perform the works in the bidding package. Model contracts from applicable Finnish associations will be used where possible.

1.22.2.8 Construction Quality Control

Quality requirements for construction works will be in accordance with the Finnish regulations and standards. Applicable regulations and standards will be defined in each contract. The appointed contractors will be responsible for quality control and its monitoring including keeping quality records. The construction management team will undertake systematic checks of the records.

In addition to inspections by the contractors and Keliber staff there will be inspections from the city inspectors covering buildings, tailings dam structures and pressure vessels.

1.22.2.9 Cost Control

A cost control engineer will be engaged for the project and be responsible for all cost control activities.

1.22.2.10 Project Personnel and Organisation

The Project team comprises personnel from Keliber, the main suppliers, EPCM contractor, civil contractor and MEI-contractor. Detailed plans for project organisation will be made at the beginning of the project execution.

1.23 Conclusions and Recommendations

The work carried out for evaluating the feasibility of Keliber's lithium project has followed industrial practices used in mining and chemical technology. Mineral Resource and Ore Reserve estimates of the lithium deposits comply with the JORC Code 2012. The engineering studies are based on test work carried out in internationally recognised facilities using commonly accepted practices. The capital and operating cost estimates developed for the project are in line with AACE Class 3 estimates, with an order of accuracy of ±15%.

Environmental aspects of the Project are important and have been studied in depth to ensure the impact of the Project is minimised and there is full compliance with all Finnish environmental regulations, permits and international guidelines.

The DFS report has been prepared by the Keliber project team, which comprises several individuals and companies, and edited by Hatch as the technical coordinator of the DFS. In total twenty parties have contributed to the Report, each having a specific area of responsibility.

Capital and operating costs have been determined and a discounted cash flow model developed to assess the project economics. The current life of mines is 13 years but the project is extended to 20 years by purchasing spodumene concentrates from third parties for 7 years after the mines are exhausted.

The values obtained for the key figures (NPV, IRR and the payback period) show that the Project is profitable.

The project risks have been evaluated in workshops and a risk register has been developed. Risk mitigation plans exists. The summary of the risk assessment by area is listed below:

Mineral resources and ore reserves

- The risks related to mineral resources are regarded as very small. The continuity of the spodumene pegmatite veins is good and a conservative approach has been adopted. The ore boundaries are mostly geological even though the cut-off grade has been applied.
- For the ore reserves the biggest risk in the modified factors is the lithium carbonate price. Risks related to other modifying factors such as mining, metallurgy, marketing, legal, environment, social and governmental are regarded as low or very low.
- The ore variability risk is regarded as minor because the ore bodies show low variability between and within the deposits. Small differences between the lithium recoveries between the deposits in minerals processing are mainly due to differences in the head grade and wall rock dilution. All these factors have been considered in the developed recovery function which is part of economic model.

Technical risk related to selected and designed process

- Designing of the process is based on representative samples and a considerable number of metallurgical studies of different scales. The whole process has been tested in pilot scale. In the forecasts on lithium recovery a conservative approach has been selected.

- The designed process is largely based on existing and proven technology which is widely used in the mining and lithium industry. Optical sorting which is rare in lithium mining is commonly used in other mining industry.
- Soda pressure leach has been used industrial scale in batch process whereas the application in continuous mode is novel. However, similar autoclave processes are common for example in the processing of gold ores, and the technology has been tested twice in pilot scale. Outotec, which has developed the process together with Keliber, has tested the technology successfully with other lithium ores. Therefore the technology risk related to soda pressure leach is regarded as low.
- The process has been designed, sized and the equipment has been selected by Outotec and Metso, both internationally recognised technology providers. Both have offered technology packages with process guarantees on throughput, process recoveries and product quality. These factors lower the technical risk related to equipment.

Country, social and environmental risks

- Finland has been continuously ranked as one of the best country in the world related to mining jurisdiction (Frazer Institute). Therefore, the country risk is regarded very minor.
- Keliber’s Project is well supported by the communities, surrounding society and landowners. Social risks is regarded as very small.
- Aspects related to environmental impact assessment and permit applications have been discussed carefully and in depth with the authorities. Keliber has received a special attention as it is the first mining company in Finland accepted for prior consultancy process in environmental and other permitting.
- In Finland and especially in the Kokkola area there exist educational programmes for chemical technology from vocational schools to higher education. In the Kokkola area several large metallurgical and chemical technology companies have substantial production facilities. Therefore the risk for not being able to engage a skilled workforce is low.

Capital and operational costs

- Capital and operational costs are based on offers from different credible operators. Technology providers Outotec and Metso have made careful basic engineering for Keliber to provide reliable cost estimates.

Project schedule

- The risks related to project schedule are highest for starting the Project according to the planned schedule. Here especially permitting and project financing may take longer than anticipated.

- The project itself has a reasonably tight schedule and delay risks are moderate. The delay risks exist for the long leading items, managing the project with seasonal climate challenges and availability of certain subcontractor and human resources.

Economical risks

- The economical risks are related to the lithium carbonate price and exchange rate (EUR vs. USD) as the project key figures are sensitive to them. Market studies and Keliber's position as the first European lithium carbonate producer support the forecasts for robust lithium carbonate price level for the life of mine.
- Risks related to delayed start-up, long ramp-up time and capacity and quality are estimated to be moderate. Several risk mitigation actions have been planned and are already in place for lowering the risks.

The recommendations for further work include normal engineering and design work related to the detailed engineering phase. No major trade-off studies are needed. Some potential savings may be obtained by applying high pressure rolls in comminution. Recent test work and development in the hydrometallurgical process indicate that the process could be made more efficient and operational costs could be lowered; for example by processing higher grade concentrate, operating without ion exchange and running the second autoclave at lower pressures. Verification of these potential savings require additional test work and piloting. These studies are recommended.

The Project has upside potential in many areas and it is recommended that these are studied:

- The Central Ostrobothnia Lithium Province has high exploration potential for lithium. Keliber has successfully increased its mineral resources in recent years and intensifying the exploration is recommended to locate additional resources. This will provide additional concentrates so the processing plants can operate with Keliber concentrates for a longer period than calculated here.
- Nb-Ta grades are moderate in the deposits and Nb-Ta concentrates are commonly produced from spodumene pegmatites. Keliber's test work in the production of Nb-Ta concentrate has been quite limited and this should be continued in future.
- Dense media separation has been tested with Keliber ores and the technique combined with flotation provides higher lithium recoveries than flotation alone. The test work should be continued especially for the deposits lower in phosphorous than in Syväjärvi.
- In the work to date the production planning and economic evaluation are based on the production of a relatively low grade concentrate, 4.5% Li_2O. Test work has extended to 6% concentrate and it is recommended that an optimisation model is developed to be used for economical optimisation of the production.

- Chemical plant has several points where there exists potential for lowering the operational costs. These items are recommended to be investigated further in laboratory and pilot test work.
- Analcime sand and quartz-feldspar sand have potential for higher value by-products. It is recommended that these investigations should be continued.