Explanatory notes concerning the Database on hard rock lithium occurrences

Database created by Tercienco bvba in cooperation with GF Consult bvba,

January 2023

1. General issues

The updated version of the Database contains information on about 775 global sites where lithium minerals are known to occur in a geological “lithium-rich hard rock” environment.

A “lithium-rich hard rock” environment is defined here as an environment where the lithium minerals are enclosed in pegmatites, granitic rocks and/or related contact metamorphic rocks, which could or could not have been affected by in-situ secondary alteration (e.g. hydrothermal alteration, weathering). Lithium mineral deposits that are associated with lithium-rich zeolites (jadarite; e.g. Rio Tinto’s Jadar deposit in Serbia) or with lithium-rich clays (hectorite; e.g. Lithium Americas Thacker Pass deposit, Nevada, USA) have not been included in the Database, nor have Li-rich brines (e.g. salars) or hydrothermal fluids.

The database has been constructed by Tercienco bvba, in cooperation with GF Consult bvba, both geological consulting companies incorporated in Belgium. Both companies are collectively referred to as the “Authors”.

For the construction of the Database numerous public sources have been consulted, including (not exhaustive), public company documents (e.g. company websites, press releases, technical reports, annual and quarterly reports, Management Discussion and Analysis,…), publications and databases available from various government/parastatal organisations (including geological surveys such as the USGS, BGS, BRGM…), publications from international cooperation agencies (e.g. United Nations, European Union,…), academic publications in (peer-reviewed) professional journals, publications in (inter)national newspapers, publications by international financial institutions (e.g. BMO Capital Markets, UBS, Deutsche Bank,…) and various databases (e.g. Mindat database) and resources available on the World Wide Web. In addition, information was obtained through several private archives and libraries that could be consulted through the Authors’ extensive professional network.

The processed information extends up to the end of December 2022.

Obviously, an extensive effort was made to obtain all relevant information necessary for the construction of the Database. Nevertheless, the available information is not exhaustive, nor complete. The Reader should be aware of this and is advised to consult the original source data as cited in the Database, as well as any other additional information on any particular occurrence that might be available.

The lithium-rich sites selected from the information available to the Authors have been classified in a number of categories according to their current degree of development. Nine categories have been defined, ranging from “indications”, which often only have been briefly investigated during some regional prospection, to “active producers” and “Important past producers”, for which a wealth of information can be found. This basis of this classification is explained below.

While all care has been taken in the compilation of the Database and its related items, the Authors cannot guarantee the trueness and reliability of the original data and disclaim any and all liability that might arise from its use.

Suggested citation for the Database :

Tercienco bvba and GF Consult bvba, 2023. Database on Global Occurences of Lithium Minerals in Hard Rock Environments – Status January 2023. Available from www.tercienco.be and www.gfconsult.be

2. Abbreviations, acronyms, chemical elements, geological terms, units

2.1. Abbreviations and acronyms

Table 2.1. Abbreviations and acronyms used in the database

Abbreviation/acronym	**Full Name**
Corp	Corporation
CRIRSCO	Committee for Mineral Reserves International Reporting Standards
DFS	Definitive Feasibility Study
FS	Feasibility Study
GIS	Geographic Information System
GKZ	Russian State Commission on Mineral Resources
Inc	Incorporated
JORC	Joint Ore Reserves Committee
JV	Joint-Venture
Ltd	Limited
NAEN	National Association for Subsoil Examination
NI43-101	National Instrument 43-101
NL	No Liability
NV	Naamloze Vennootschap
PEA	Preliminary Economic Assessment
PERC	Pan-European Reserves and Resource Reporting Committee
PFS	Preliminary Feasibility Study
Plc	Public Limited Company
Pty	Proprietary
SA	Société Anonyme
SAMREC	South African Mineral Resource Committee
SQUI	Spodumene-Quartz Intergrowth

Geographical (*cardinal*) directions (north, south, east and west) are often represented by their initials in the Database, i.e. N, S, E and W, as are intercardinal and secondary intercardinal directions (e.g. NW, NNE, WSW,…).

2.2. Chemical elements and formulas

Chemical elements can be represented in the Database by their chemical symbol, or by a chemical formula in the case of compounds. The following table explains some of the commonly used symbols and formulas.

Table 2.2. Symbols of chemical elements and chemical formulas that are frequently used in the database

Symbol/formula	Full name
Cs	caesium
Cs_2O	caesium oxide
Fe	iron
Fe_2O_3	iron trioxide, also commonly known as "*ferric oxide*"
K	potassium
Li	lithium
Li_2O	lithium oxide, also commonly known as "*lithia*"
Mn	manganese
Nb	niobium
O	oxide
Rb	rubidium
Sn	tin
SnO_2	tin oxide (might also refer to the mineral cassiterite)
Ta	tantalum
Ta_2O_5	tantalum pentoxide
Th	thorium
Ti	titanium
U	uranium

2.3. Geological terms and orientations of geological features

Used geological terms generally follow standard definitions. However, some terms deserve special mention here since different definitions and common interpretations exist. Their meaning as used in the Database is specified in the table below.

Table 2.3. Definition of some geological terms that are used in the database

Geological term	Definition
Pegmatite	Essentially an igneous rock, mostly of granitic composition that is distinguished from other igneous rocks by its extremely coarse but variable grain size or by an abundance of crystals with skeletal graphic, or other strongly directional growth habits (London, 2014[i]). Pegmatites are often found close to, and/or genetically associated with large plutonic intrusions.
Dyke	A planar body of igneous rock which is clearly discordant, i.e. it cuts the host rock bedding and/or other structural planes (e.g. foliation)
Sill	A planar body of igneous rock which is roughly concordant, i.e. it is roughly parallel to the host-rock bedding or other structural planes (e.g. foliation)
Greisen	Mica-rich zone in an igneous (mostly granitic) rock, that formed through self-generated alteration during the emplacement of the pluton. It is a class of endoskarn.
Mineral Resource	A concentration or occurrence of solid material of economic interest in or on the Earth's crust in such form, grade or quality and quantity that there are reasonable prospects for eventual economic extraction. The location, quantity, grade or quality, continuity and other geological characteristics of a Mineral Resource are known, estimated or interpreted from specific geological evidence and knowledge, including sampling. Mineral Resources are subdivided in several classes, e.g. Inferred, Indicated and Measured, which reflect increasing geological confidence.

Directions of geological features (e.g. strike and dip of a geological planar feature) should be interpreted as follows :

- Directions of strike : clockwise degrees from the geographical direction indicated (usually the true north), e.g. “N050-striking” means that the strike is 50 degrees eastward from the true (geodetic) north
- Dip : the dip angle of a feature is measured from the horizontal plane and its direction is specified by geographical initials, e.g. “70W-dipping“ means that the feature is dipping to the west at an angle of 70 degrees from the horizontal plane.

2.4. Units

Unless explicitly stated otherwise, metric units are used. The table below explains the meaning of units that occur in the Database

Table 2.4. Explanation of units used in the database

Unit (symbol)	Full name/explanation
%	Percentage. From the original source(s), it is not always clear whether this means weight percentage or volume percentage. As a general rule, it can be assumed that it signifies weight percentage (wt%) if it concerns the elemental composition of minerals or ores (e.g. grade), and volume percentage (vol%) if it concerns the amount of a mineral in a volume of rock (e.g. in a statement such as “the pegmatite contains 15% of spodumene”). However, exceptions are possible and the Reader is referred to the original source(s) for more information.
tonnes	metric tonnes
Mt	million metric tonnes
ft	feet
m, cm, dm, km, m^2, m^3, km^2	meter, centimeter, decimeter, kilometer, square meter, cubic meter, square kilometer

3. Definitions of attributes in the Database

For each site in the Database relevant information is given in several attribute fields. The table below gives the general definitions for each attribute. Where necessary the attributes and their possible predefined values (codes) are further specified in dedicated subsections.

Table 3. Definitions of attributes of the database

Attribute	Definition
Name	The common name for the site. Alternative names are possibly mentioned in the Comments attribute.
Region	The continental region in which the site is located. Continental regions used are Europe (excluding Russia), Asia (including Russia and Asia Minor), Africa, North America, South America (including Middle America) and Oceania.
Country	The country in which the site is located.
State_Province	The state, province, or equivalent administrative region in which the site is located.
Cluster	The cluster in which the site is located. Clusters have been defined arbitrarily through visual inspection of the geographical distribution of the sites. In North and South America and in Europe, clusters generally have a radius of about 20km. However, in Africa and Asia, they can have radii of 100km or more.
DepositType	The geological type of lithium mineralisation at the site. Three categories are distinguished, i.e. pegmatite-type, greisen-type, and granite-type. See Table 3.1.
LiMineral_Main	The most abundant and economically most important lithium minerals present in the mineralisation. Sixteen minerals are considered (see Table

	3.3.). **The minerals are ordered according to mineralogical type, NOT according to abundance or importance (which is often debatable and can change over time)**.
LiMineral_Other	The lithium minerals of lesser importance that are present in the mineralisation. Sixteen minerals are considered (see Table 3.3.). **The minerals are ordered according to mineralogical type, NOT according to abundance or importance (which is often debatable and can change over time)**.
DepositStatus	The development status of the lithium mineralisation at the site. Nine categories are defined which generally reflect the current development status of the mineralisation. See Table 3.2.
Resource_Li2O_t	The total amount of Li_2O (in metric tonnes) that make up the known, current resource of the mineralisation at the site. This figure has been taken either directly from the document cited in the Resource Reference attribute or has been recalculated from information given in the cited document, e.g. in case the cited source only provided figures for bulk ore tonnage and grade (thus not for contained amount of Li_2O), and/or various units (e.g. short tons versus metric tonnes) and expressions (e.g. Li-metal, Li_2O) were used. The tonnage can also have been recalculated from figures that apply to various parts of the orebody/orebodies that have been included in the ultimate resource under consideration. **The Reader is referred to, and should rely on, the cited source for the original information behind this number.** For current and past producers of lithium minerals, the original resource (before mining), or last known resource can be discussed in the Comments attribute if this information was available to the Authors.
Grade_Li2O_perc	The grade of the known, current resource of the mineralisation in wt% Li_2O. Possibly, this number has been recalculated from other expressions (e.g. Li-metal). The Li-grade can have been recalculated in function of the tonnage, e.g. when several parts of an orebody (with different Li-grades) have been included in the resource estimation. **The Reader is referred to, and should rely on, the cited source for the original information behind this number.** For current and past producers of lithium minerals, the original grade of the resource (before mining), or grade associated with the last known resource can be discussed in the Comments attribute if this information was available to the Authors.
ResourceYear	The year in which the quoted resource has been calculated.
ResourceType	The type of resource that has been calculated. Resource types are grouped into two main categories, i.e. CRIRSCO-compliant and non-CRIRSCO-compliant resource statements. The latter is further subdivided into recent (i.e. less than 10 years old) resource statements by governmental institution or company publications, or statements within academic publications, and older statements (i.e. more than 10 years old) which are invariable defined as "historical estimates". See Table 3.4.
ResourceReference	Gives a citation to the bibliographic reference in which the current resource figures (tonnage, grade) are quoted. Full bibliographic references of authored sources can be found in the Reference List document. See section on "Citations and References" for more information
ProductType	Type of sales product produced from the deposit. These sales products can be either mineral concentrates, or high-purity chemical end-use products in case of integrated mining, processing, and refining operations. The latter are given by their chemical formula (e.g. Li_2CO_3, $LiOH.H_2O$, LiF). In case of mineral concentrates, the minerals (e.g. spodumene) are specified, as well as the Li_2O-grade of the concentrate. For example, "SC-6%" means a "spodumene concentrate grading 6 wt% Li_2O".

ProductionTarget_Li2O_tpa	Declared targeted annual production, in metric tonnes per year of Li_2O. This figure has been extracted from either regulated company documents (press releases, annual or financial reports), or estimated based on information from other sources.
ProductionAchieved_Li2O_tpa	Declared or estimated production achieved during the year specified, in metric tonnes per year of Li_2O. This figure has been extracted from either regulated company documents (press releases, annual or financial reports), or estimated based on information from other sources. **The Reader is referred to, and should rely on, the cited source for the original information behind this number.**
ProductionAchievedYear	Year during which the quoted production was achieved.
ProductionReference	Citation to the source document from which the production information has been extracted. See section on "Citations and References" for more information.
Owner_2021	Gives the current company (private, public or parastatal) or natural person that holds, or has a legal agreement to acquire (e.g. through an option agreement), the majority of the mining rights over the lithium mineralisation at the site, if this information was known to the Authors (status December 2021). **However, this information is indicative at best, is often highly volatile and should not be relied upon.**
Comments	Gives a number of relevant characteristics of the lithium mineralisation. Depending upon the information available, these characteristics generally include : the development status of the occurrence with regard to lithium, the type of lithium mineralisation, the dimension of the lithium orebody (length, width, thickness), the strike and dip of the orebody and/or its spatial extent, the host rocks, the main and minor Li-minerals and their occurrence (e.g. crystal size of the important Li-minerals) and known accessory minerals. Possible historical production figures (for lithium minerals) and periods can be given, as well as historical resource estimations. The comments section also specifies the types of resource subclasses (inferred, indicated, measured) that have been included in the resource estimation, as well as the cut-off value used. Other information, e.g. related to the discovery, ownership or exploration history might be included.
Reference_General	Gives a citation to the bibliographic references that served as the source for the information provided in the Comments and other attribute fields. Full bibliographic references of authored sources can be found in the Reference List document. See section on "Citations and References" for more information.
Latitude	The latitude of the site. See "Spatial coordinates and their accuracy" for more information.
Longitude	The longitude of the site. See "Spatial coordinates and their accuracy" for more information.

3.1. Deposit types

Table 3.1. Types of lithium mineralisation distinguished in the database

Deposit Type code	**Description**
Pegmatite	Lithium minerals occur in a pegmatite. Lithium-rich pegmatites belong to the so-called "Lithium-Caesium-Tantalum" subclass and main lithium minerals in these pegmatites are spodumene and to a lesser amount petalite and lepidolite. They can occur as important mineral components (up to tens of vol%) of the pegmatite. The pegmatites can show strong compositional zoning or have a homogenous mineral distribution.
Greisen	Lithium minerals, mainly mica's such as zinnwaldite and phosphates (amblygonite, montebrasite) occur in the strongly altered part of an igneous

	granitic pluton (greisen sensu stricto) and/or in a stockwork of quartz veins closely associated with this altered part. Although this stockwork often occurs at least partly within the host rocks surrounding the pluton, its formation is closely related with the greisen.
Granite	Lithium minerals (often Li-rich mica's, such as lepidolite, zinnwaldite) occur in a relatively large amount as primary components in granitic rock. Such deposits can be of vast extent, but are generally of relatively low Li-grade. However, grades might have been increased through secondary alteration processes.

3.2. Lithium minerals

Table 3.2. Lithium minerals considered in the database

Mineral code	Mineralogical group	Mineralogical formula	Definition source
Spodumene	Inosilicate	$LiAlSi_2O_6$	IMA [1]
Holmquistite	Inosilicate	$Li_2(Mg_3Al_2)Si_8O_{22}(OH)_2$	IMA [1]
Petalite	Tectosilicate	$LiAlSI_4O_{10}$	IMA [1]
Eurcryptite	Nesosilicate /tectosilicate	$LiAlSiO_4$	IMA [1]
Bikitaite	Tectosilicate	$LiAlSi_2O_6.H_2O$	IMA [1]
Lepidolite	phyllosilicate	$K(Li,Al,Rb)_2(Al,Si)_4O_{10}(OH,F)_2$	member of the polylithionite-trilithionite series (IMA[1]); see https://en.wikipedia.com/Lepidolite
Zinnwaldite	Phyllosilicate	$KLiFeAl(AlSi_3)O_{10}(OH,F)_2$	member of the siderophyllite-polylithionite series (IMA[1]); see https://en.wikipedia.com/Zinnwaldite
Trilithionite	Phyllosilicate	$KLi_{1.5}Al_{1.5}(Si_3Al)O_{10}F_2$	IMA [1]
Lithian mica	Phyllosilicate		Any Li-rich mica, without specification
Cookeite	Phyllosilicate	$(Al,Li)_3Al_2(Si,Al)_4O_{10}(OH)_8$	IMA [1]
Amblygonite	Phosphate	$LiAl(PO_4)F$	IMA [1]
Montebrasite	Phosphate	$LiAl(PO_4)(OH)$	IMA [1]
Lithiophilite	Phosphate	$LiMn(PO_4)$	IMA [1]
Triphylite	Phosphate	$LiFe(PO_4)$	IMA [1]
Elbaite	Cyclosilicate	$Na(Al_{1.5}Li_{1.5})Al_6(Si_6O_{18})(BO_3)_3(OH)_3(OH)$	IMA [1]
Rossmanite	Cyclosilicate	$(AL_2Li)Al_6(Al_6O_{18})(BO_3)_3(OH)_3F$	IMA [1]
Fluor-liddocoatite	Cyclosilicate	$Ca(Li_2Al)Al_6(Si_6O_{18})(BO_3)_3(OH)_3F$	IMA [1]

[1] *see the International Mineralogical Association (IMA) Database of Mineral Properties at http://rruff.info*

3.3. Deposit status

Table 3.3. Categories used to describe the development status of a site in the database

DepositStatus code	Definition
1 – active producer	Occurrence of Li-minerals in a hard rock environment that is currently being mined (for Li-minerals).
2 – mine on care and maintenance	Occurrence of Li-minerals in a hard rock environment that has been mined (for Li-minerals), but that is currently placed on care and maintenance.
3 – development-stage	Occurrence of Li-minerals in a hard rock environment that have been studied in depth and for which a up-to-date positive feasibility study for commercial extraction has been made, or for which formal economic mineral reserves have recently been calculated.

4 – feasibility-stage	Occurrence of Li-minerals in a hard rock environment which has been explored to an extent that allows for an in-depth evaluation of commercial Li-extraction according to the current industry best practices. Preliminary mining studies have been made (e.g. prefeasibility study, preliminary economic assessment, scoping study), but an up-to-date feasibility study has not yet been made.
5 – prefeasibility-stage	Occurrence of Li-minerals in a hard rock environment which has been investigated by surface exploration, possible underground workings and by Li-focussed drilling, and for which recent CRISCO-compliant resources have been declared, but for which no mining studies have yet been made.
6 – advanced exploration	Occurrence of Li-minerals in a hard rock environment which has been investigated surface exploration, possibly underground workings and by Li-focussed drilling, but for which no recent, CRIRSCO-compliant resources have yet been estimated. Possible historical resources are often of a speculative nature or at a low level of confidence.
7 – early exploration	Occurrence of Li-minerals in a hard rock environment that has been investigated by superficial exploration activities (see "early exploration stage") and in addition, (limited) knowledge of the underground extension of the Li-mineralisation is known or should be available (e.g. obtained through historical mining activities). However, it is not known (and often doubtful) if this knowledge was obtained through use of Li-focussed drilling. Possible historical resources are often of a speculative nature.
8 – indication	An occurrence of Li-minerals in a hard rock environment which has been investigated only by superficial observation (possibly of academic nature) and/or non-systematic prospection. Generally, little or no public information is available about the current status of exploration.
9 – important past producer	Occurrence of Li-minerals in a hard rock environment that has been mined in the past and that yielded a large amount of Li-minerals, but which is currently inactive and/or possibly exhausted and is currently not being investigated.

The different status categories and their main transition criteria are graphically depicted in the figure below.

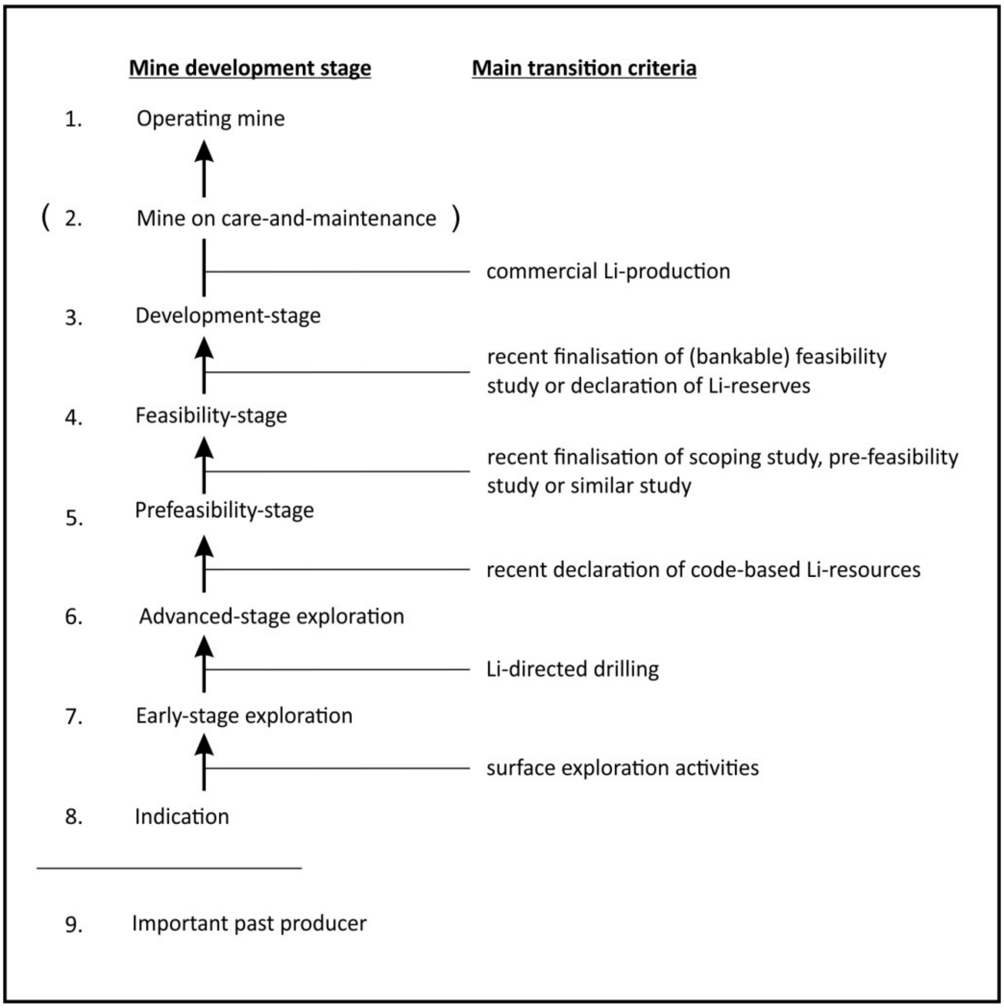

Figure 1. Status categories used in the database

3.4. Resource types

The categories that have been used in the Database to characterise the nature of the resource estimation made for a site in the Database are summarised in the table below. These categories fall into two groups/classes, i.e. resources estimations that have been made according to rules and schemes that follow the guidelines of the Committee for Mineral Reserves International Reporting Standards (CRIRSCO; www.crirsco.com), and resource estimations for which this was not the case or for which it is not explicitly known whether the CRIRSCO-guidelines were followed or not.

There exist several international reporting codes that follow the CRIRSCO guidelines. The ones that are used in the Database are listed in Table 3.4. It can be assumed that these resource estimations have been made according to the industry best practices.

Importantly, for the second group (non CRIRSCO-compliant estimations), key assumptions, parameters and methods used in the resource calculation are often not known and the reliability and accuracy of the resource estimation cannot be assessed. Therefore, great care should be taken in their interpretation.

This second group has been subdivided into resource statements that have been made within the last decade (i.e. a time when CRIRSCO-compliant resource definitions had become the industry standard, and were widely used in public reporting of mineral resources and reserves), and resources statements that are older than ten years. In addition, it has been judged useful by the Authors to differentiate between statements made in official government or company publications (where resources often form an important part of the asset described), and statements made in peer-reviewed academic publications (where resource figures are often only mentioned as additional information to the core issue of the publication).

Table 3.4. Categories used to classify the type of Li-mineral resources for a site in the Database

Class	ResourceType code	Definition
CRIRSCO-compliant ("CODED")	JORC 2004	Mineral resources have been established in compliance with the reporting code created by the Joint Ore Reserves Committee (JORC) of the Australasian Institute of Mining and Metallurgy, Australian Institute of Geoscientists, and Minerals Council of Australia in 2004.
	JORC 2012	Mineral resources have been established in compliance with the reporting code created by the Joint Ore Reserves Committee (JORC) of the Australasian Institute of Mining and Metallurgy, Australian Institute of Geoscientists, and Minerals Council of Australia in 2012.
	NI43-101	Mineral resources have been established in compliance with Canadian National Instrument 43-101 - Standards of Disclosure for Mineral Projects. The NI 43-101 requires the use of CIM (Canadian Institute of Mining, Metallurgy and Petroleum) Definition Standards on Mineral Resources and Reserves.
	GKZ/NAEN	Mineral resources have been established in compliance with the Russian Code for the Public Reporting of Exploration Results, Mineral Resources, Mineral Reserves (NAEN Code) or its predecessor (pre-2011), the classification scheme previously adopted by the Russian State Commission on Mineral Resources (GKZ). While the NAEN Code is a reporting code that follows the guidelines of the Committee for Mineral Reserves International Reporting Standards (CRIRSCO; www.crirsco.com), the GKZ Code was not. However, definitions on mineral resources and reserves used in the latter can be mapped/converted to CRIRSCO-compliant definitions.
	PERC 2013	Mineral resources have been established in compliance with the reporting standard created by the Pan-European Reserves and Resources Reporting Committee in 2013.
	SAMREC 2016	Mineral resources have been established in compliance with the South African Code for Reporting of Exploration Results, Mineral Resources and Mineral Reserves (SAMREC), established in 2016.
Non CRIRSCO-compliant ("NON CODED")	Recent company/government resource statement	Mineral resources were quoted in an official government publication that was published within the last decade. It is not known by the Authors if the CRISCO-guidelines were followed in the resource calculation.
	Recent academic resource statement	Mineral resources were quoted in an article that appeared within the last decade in an international, peer-reviewed scientific journal. It is not known by the Authors if the CRISCO-guidelines were followed in the resource calculation.
	Historical estimate	Mineral resources were historically (> 10 years old) established in a way that does not follow CRIRSCO-guidelines, or for which it is not explicitly known whether they did or not.

3.5. Accessory minerals

The Database mentions a number of selected minerals that have been reported to accompany the lithium mineralisation at each specific site. These minerals are listed in Table 3.5. The minerals were selected because of their common association with lithium minerals in the hard rock environments envisaged and because of their potential use as an ore for rare metals (e.g. Nb, Ta, Sn, W, Cs, Rb, Be, rare earths) or specialised industrial minerals (e.g. beryl, fluorite, topaz), similar as for the lithium minerals. This selection does not cover all minerals (minor or major) that can accompany the Li-mineralisation. Common accompanying gangue minerals such as quartz, feldspar and mica's have not been included in this list although they can also occur as rare varieties in the environments concerned.

Table 3.5. Accessory minerals (or group of minerals) considered in the database

Mineral code	**Mineralogical group**	**Mineralogical formula**	**Definition**
Coltan			Any mineral that is an ore for niobium and tantalum
Pollucite	Zeolite	$Cs(Si_2Al)O_6.nH_2O$	IMA [1]
Garnet	Nesosilicate	$(Fe,Mg,Mn,Ca)_3(Al,Fe,Cr)_2Si_3O_{12}$	See https://en.wikipedia.org/wiki/Garnet
Topaz	Nesosilicate	$Al_2SiO_4F_2$	IMA [1]
Beryl	Cyclosilicate	$Be_3Al_2Si_6O_{18}$	IMA [1]
Tourmaline	Cyclosilicate	$(Ca,K,Na,[])(Al,Fe,Li,Mg,Mn)_3(Al,Cr,Fe,V)_6(BO_3)_3(Si,Al,B)_6O_{18}(OH,F)_4$	See https://en.wikipedia.org/wiki/Tourmaline
Monazite	Phosphate	$(Ce, La, Nd, Sm)(PO_4)$	IMA [1]
Cassiterite	Oxide	SnO_2	IMA [1]
U-oxides	Oxide		Any oxide mineral that is an ore for uranium
Fluorite	Fluoride	CaF_2	IMA [1]
Wolframite	Tungstate	$(Fe, Mn)WO_4$	See https://en.wikipedia.org/wiki/Wolframite

[1] *see the International Mineralogical Association (IMA) Database of Mineral Properties at http://rruff.info*

4. Citations and references

4.1. Public company documents

Numerous public company documents have been investigated for the construction of the Database. Often, this information cannot be assigned to a specific author. For the sake of simplicity, the Database refers to these documents by using a citation form that follows a fixed scheme, i.e.

[company name] [document type] [document release date(s)]

In the company name, the legal suffix might have been omitted and document types have been abbreviated according to the values in Table 4.1.

In case several documents are concerned, the release date states the period over which the documents have been issued, e.g. "Core Exploration Ltd PRs 2017-2018" refers to all relevant press releases issued by Core Exploration Ltd throughout the years 2017 and 2018. In case a specific document is targeted, the document release date follows the form "*yyyymmdd"* (year, month, day), e.g. "Ardiden PR20171004" refers to a press release of Ardiden Ltd made on 4 October 2017".

Table 4.1. Abbreviations used for company documents

Abbreviation	Full name
PR(s)	Press release(s)
Q1, Q2, Q3, Q4	Quarterly report for the annual quarters indicated
AnnRpt	Annual Report
MDA	Management Discussion and Analysis Report

In case information has been retrieved from company websites, the month and year that the website was accessed is mentioned.

4.2. Other sources of information

Authored documents (including technical reports issued by companies) and databases of parastatal organisations (e.g. Mineral Deposit Inventory database of the Ontario Geological Survey) are cited appropriately. Full bibliographic references for these citations are provided in a separate document entitled “Li_WDB_References” (provided in Microsoft Excel and PDF format).

5. Spatial coordinates and their accuracy

Coordinates of each site are given as longitude and latitude for a Geographical Projection with WGS84 datum.

The positional accuracy for the location of each site was checked against mineral occurrence maps and figures in reports, as well as against recent and historical Google Earth TM satellite imagery. All spatial data was processed in a GIS-environment. The location of the sites was defined on the basis of the highest resolution data available to the authors. This means that the accuracy can vary. However, it is estimated that, in general, the coordinates locate the sites within 1,000m of their true location.

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[i] London, D., 2014. A petrologic assessment of internal zonation in granitic pegmatites. Lithos, v. 184-187, p. 74-104.