



The Geology and Mineralogy of the Carbo Property, Wicheeda Carbonatite Complex, BC

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Introduction

Carbonatites are rare magmatic rocks that are composed of over 50% carbonate minerals. They are generally associated with continental rift related tectonic settings. Carbonatites are commonly enriched in REE's, Nb, and P. We know very little about the genesis of these rocks as a whole.

The Wicheeda carbonatite complex is located 80 km northeast of Prince George, B.C., and is part of the Rocky Mountain Rare Metal Belt. It is located in the Copley Mountain Range as part of the Foreland belt. The property is underlain by upper Cambrian and lower Ordovician Kechika Group sedimentary rocks. Plug, dike and sill-like carbonatite and syenite plugs intrude the group. The carbonatites and alkaline complexes within the Foreland belt are dominantly of Mississippian to Devonian in age. The Wicheeda carbonatite complex has been historically explored for its REE potential but until recently there has been very little extensive exploration.

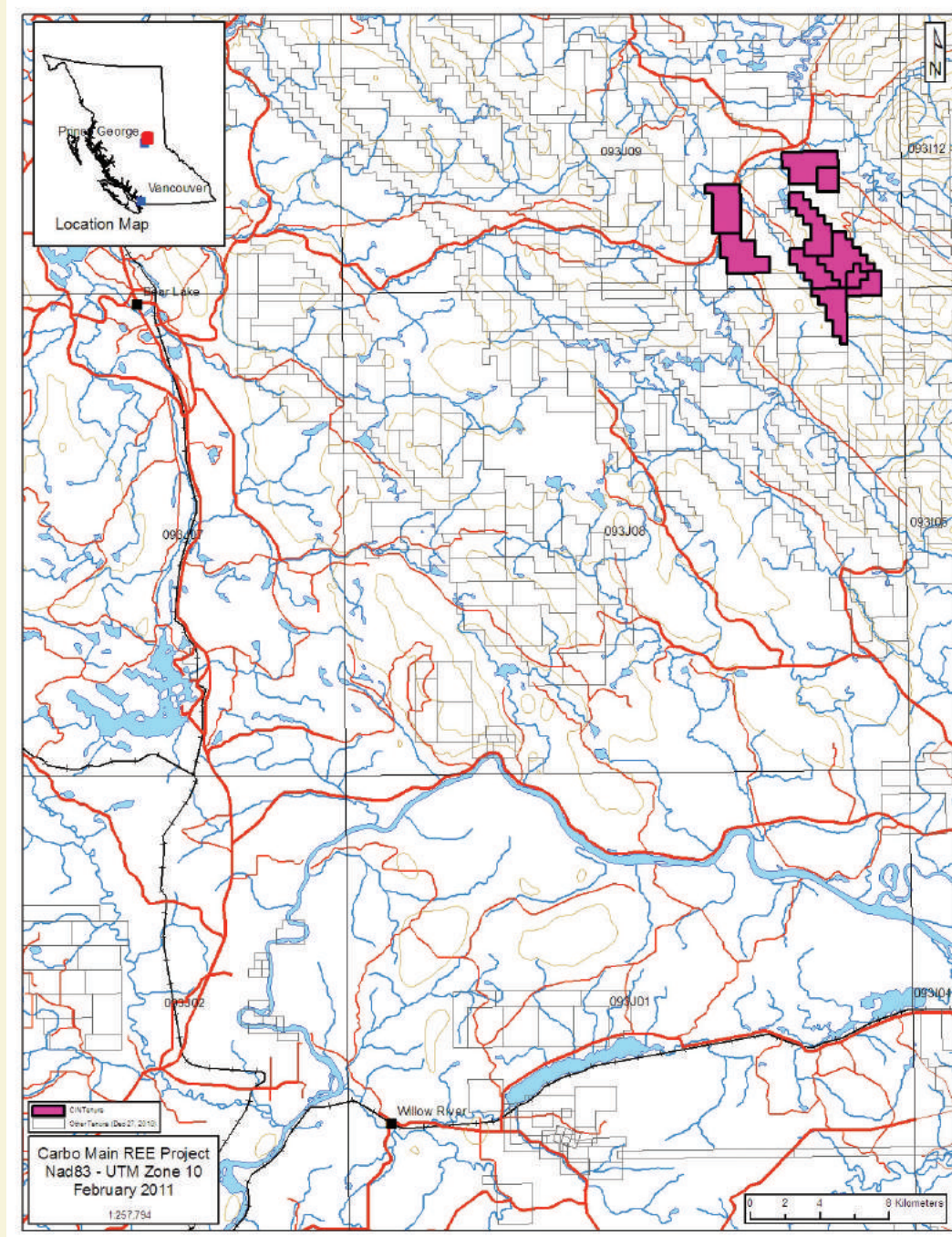


Figure 1. Carbo Property Map and Location (Turner, 2011)

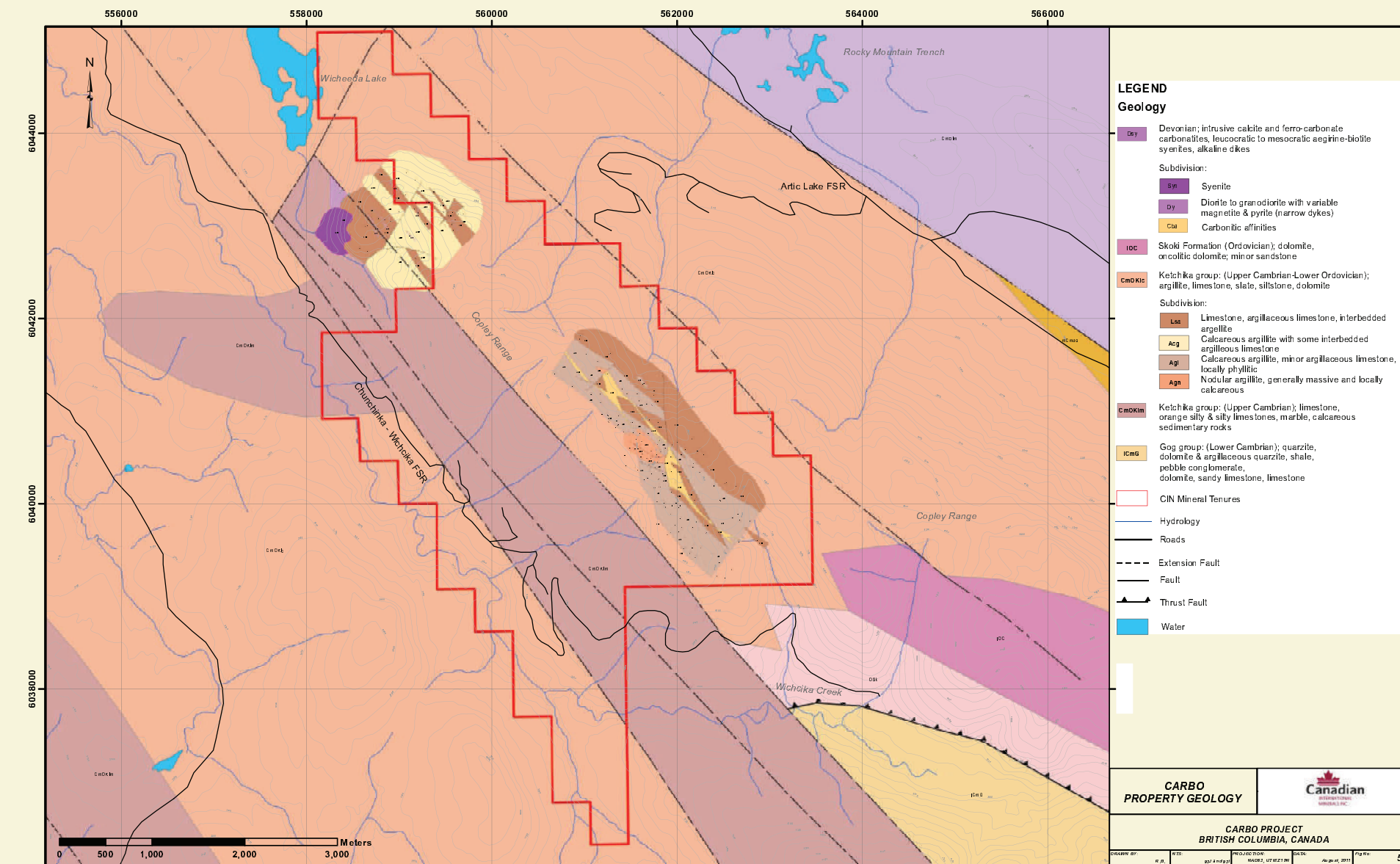


Figure 2. Geological map of the Carbo Property (Bruland, 2011)

Purpose

Work has begun to determine the geology, mineralogy, geochemistry and geochronology of the Wicheeda carbonatite complex. This is being done through the sampling of drill core, historic trenches, outcrops and completion of geological mapping followed by sample analysis using field and laboratory techniques. This research is being completed in order to:

- contribute to the general knowledge about carbonatite alkaline rock complexes
- determine the petrogenesis of the Wicheeda carbonatite complex
- determine the reason and location of REE enrichment and whether it may be economic
- determine the age of the Wicheeda carbonatite complex
- contribute to determining a successful exploration strategy

Preliminary Results of Petrography

Lithologies

Corresponding photos show the described rocks

I. Carbonatites

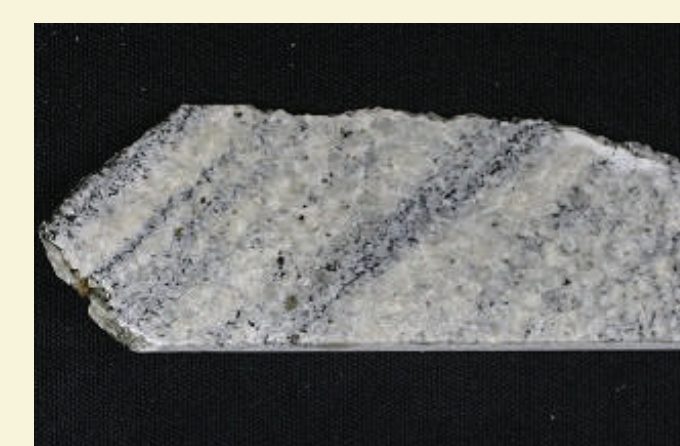
- Calcio-carbonatite to Ferro-carbonatite
 - Major phases: calcite, ankerite, dolomite
 - Minor and accessory phases: strontio-aragonite, barite, feldspar, sulphides (pyrrhotite, pyrite, sphalerite, galena), oxides (magnetite, rutile, ilmenite), mica, REE minerals, pyrochlore and other phases
 - Textural varieties and compositional features:
- Altered carbonatite
 - Major alteration phases: pyroxene, chlorite, biotite



Carbonatite with REE minerals



Carbonatite with REE minerals



Coarse grained, layered calcite carbonatite



Carbonatite with biotite phenocrysts and carbonatite with feldspar



Carbonatite pyroxene and biotite phenocrysts



Coarse grained carbonatite with ankerite and pyroxene

II. Syenites

- Syenite
 - Major phases: feldspar, quartz
 - Minor and accessory phases: zircon, apatite, sulphides (pyrite, sphalerite, galena), titanite
 - Textures: medium grained to coarse grained
- Syenite with sodalite
 - Major phases: feldspar, quartz
 - Minor and accessory phases: sodalite, sulphides (pyrite, sphalerite, galena)
 - Textures: Very fine grained matrix with sodalite phenocrysts and veins and altered clasts
- Altered syenite
 - Major alteration phases: pyroxene, chlorite, biotite



Coarse grained feldspar rich syenite



Coarse grained feldspar rich syenite with titanite



Syenite with clasts and sulphides



Syenite with clasts and sodalite vein

III. Other rock types

- Ultramafic and mafic dykes
- Carbo-hydrothermally altered
- Breccias
 - Mineralized with a carbonatite matrix (REE minerals and molybdenite)
 - Unmineralized with a carbonatite matrix
- Altered sedimentary host rock
 - Biotite, chlorite, carbonate
 - Riebeckite fenite



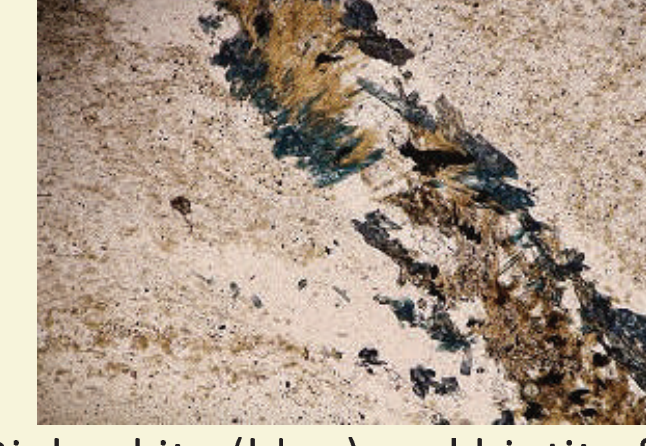
Lamprophyre dyke with coarse grained biotite crystals



Breccia with carbonatite matrix and molybdenite



Carbo-hydrothermal altered sedimentary rocks



Riebeckite (blue) and biotite fenite

REE Mineralisation

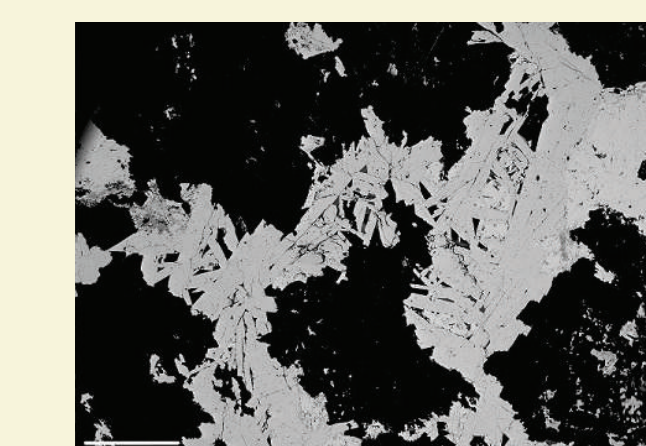
- Major REE Mineralogy
 - Monazite
 - Bastnaesite. Parasite, Synchronite
 - Single, individual grains in carbonatite matrix
 - Syntaxial intergrowths with each other
- Minor REE Mineralogy
 - Burbankite
 - Ancylite
 - Aeshynite



REE mineral rich cumulate within carbonatite



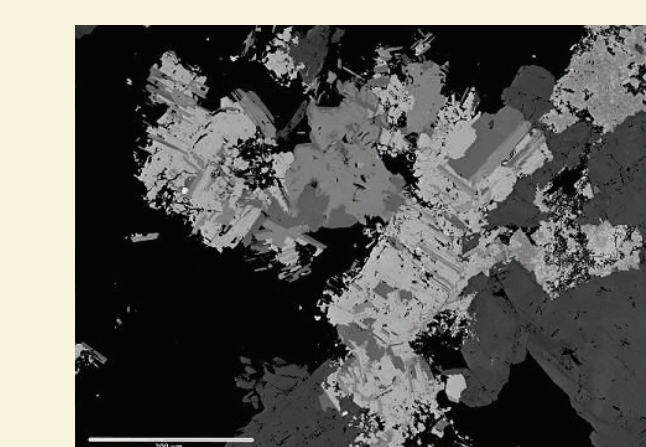
Photomicrograph in xpl - Carbonate, monazite, burbankite (4.2mm)



BSE image - Monazite (lt. gy), burbankite (v. lt. gy)



Photomicrograph in xpl - Carbonate, plagioclase, bastnaesite (2.0mm)



BSE image - Bastnaesite (v. lt. gy.), parisite (lt. gy.), synchronite (md. gy.)

Methodology

The following methodology has/is being used to study the origin of the carbonatites and associated rocks

- Petrography
 - Documentation of relevant rock types
- Mineralogy
 - Mineral compositions of major and accessory phases, mineral assemblages, microscopic textures and individual mineral textures.
- Isotopic studies
 - Pb-Pb system: dating of zircons within syenites
 - Sr-Nd system: to provide information on the source of the magmatic rocks.

Conclusions

Current results from core logging, field work and petrography allow for the following conclusions:

- Carbonatites are formed mostly of calcite and ankerite and there are several textures and alteration degrees
- REE mineralisation is found within the carbonatites and is complex at a microscopic scale
- REE mineralisation is dominantly light lanthanide enriched
- REE mineralisation decreases along the ridge towards the south east
- There are two main types of syenites, neither hosting significant amounts of REEs

Understanding carbonatites and the mineralogy of REE deposits is important to determine a successful exploration strategy, whether a deposit is economic or not, and could assist in exploration of other REE deposits in the Rocky Mountain Rare Element Belt as a whole.

References

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