Appendix B5 – Hope Bay Project Petrography Report

Petrography Report

CHARACTERIZATION OF CRUSHED ROCK
HOPE BAY PROJECT, NUNAVUT
CANADA

Feb 7, 2011

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Background

Ten crushed rock samples from the Hope Bay Project are characterized in this report. Optical reporting was requested by Lisa Barazzuol of SRK Consulting (Canada) Inc. A geological writeup on the Hope Bay project and QXRD data for the samples was provided by Lisa Barazzuol. The samples were received by Kathryn Dunne from Maxxam laboratory at the end of November and submitted for polished thin section production at Vancouver Petrographics Ltd. on Dec. 3, 2010 by Kathryn Dunne. The prepared polished thin sections were received in January and then examined optically by Kathryn Dunne. The purpose of the optical study was to characterize the mineralogy with particular emphasis on sulphide minerals and any carbonate minerals present.

The optical observations are summarized below and petrographic descriptions of polished thin sections with representative photomicrographs follow the summary. All percentages in the descriptions are approximate based on visual estimation.

Definition of terms

Please note that the term "Fe-ox" is used in this report for unknown iron-oxides, -hydroxides, -oxyhydroxides, hydroxy-sulphate and/or oxyhydroxy-sulphate minerals. The term "rutile" is used in this report for very fine-grained Ti-oxides which may also include leucoxene and anatase. The term "sericite" is used in this report as a fine to very fine-grained colourless mica, either muscovite, illite, or paragonite.

Summary

The samples comprise fine to coarse rock chips (< 24 mm) and liberated mineral grains. Rock chips represent altered and variably deformed mafic volcanic/intrusive rock, sedimentary rock and quartz veins (based on Rock Type code provided). The alteration and deformation have resulted in strongly foliated and banded rock fragments with virtually no features of the protoliths remaining. Deformation in altered igneous rocks is represented by sericite, chlorite and/or rutile aggregates defining a strong foliation fabric. In some samples, bands of sericite-rutile or chlorite-rutile alternate with massive bands of carbonate-quartz aggregate. Rock chips generally comprises some of the following mineral assemblages: 1) rutile-chlorite-quartz-carbonate, 2) quartz-carbonate, 3) sericite-chlorite-carbonate, 4) albite-quartz-carbonate (Madrid deposit), 5) sericite-rutile± tourmaline ±pyrite and 6) quartz-sericite-carbonate-rutile. Vein fragments comprise quartz±carbonate and carbonate aggregate.

Carbonate occurs in major amounts in the sections (10-50%) with the exception of one quartz vein sample (HC-53) which has trace amounts of carbonate (see tabular summary, over). Carbonate occurs as colourless to locally cloudy brownish, fine to very fine-grained and locally medium-grained aggregates. Carbonate occurs as: 1) anhedral to less commonly rhombic, patchy aggregates within foliated fragments, 2) anhedral aggregates within massive quartz-carbonate and carbonate aggregate, 3) anhedral aggregates within quartz±carbonate vein fragments and carbonate stringers and 4) anhedral liberated grains. Some of the carbonate in sample HC-17 is calcite based on reaction to HCl. In sample HC-24, some of the carbonate is partly replaced by minor (~1%) amounts of Fe-ox which occurs as very fine-grained, red-brown aggregates of unknown composition. In samples HC-50 and HC-52, very fine-grained Fe-ox aggregate occurs rarely partly replacing carbonate. In sample HC-51, very fine-grained Fe-ox aggregate occurs in late fractures.

Summary cont.

Sulphide occurs in trace to major amounts (up to 5%) as pyrite and in trace amounts or rarely as chalcopyrite in most sections (see tabular summary, below). Rare sphalerite is observed as inclusions in pyrite in sample HC-20. Rare amounts of unknown phases are observed in samples HC-20 and HC-55. Pyrite grains are fine to very fine-grained, rarely medium-grained (HC-32), and occur disseminated, as clusters and as patchy sub-anhedral or eu-anhedral grains and aggregate in altered rock fragments and as liberated anhedral grains and aggregate. In sample HC-53, pyrite occurs disseminated in trace amounts in quartz vein fragments. Pyrite grains have irregular to straight grain boundaries which are unaltered. Chalcopyrite grains are fine to very fine-grained and can occur disseminated in rock fragments, as anhedral aggregates associated with pyrite, as inclusions in pyrite or as liberated grains. Chalcopyrite grains are unaltered. Rare, unknown, high reflectance very fine grains occur as aggregates associated with pyrite and as inclusions in pyrite in sample HC-20. Another unknown, highly reflective phase occurs as rare, patchy fine to very fine-grains in sample HC-55.

Tabular summary:

Sample #	**Sulphide**	**% ~**	**Carbonate occurrence**	**% ~**	**Fe-Ox**	**% ~**	**Other**	**% ~**
HC-17	pyrite chalcopyrite	2 tr	colourless, fine to very fine-grained	40		x	chlorite quartz rutile sericite feldspar	40 8 8 1 tr
HC-20	pyrite chalcopyrite unknown sphalerite	5 r r r	colourless to cloudy brownish, fine to very fine-grained	50		x	quartz plagioclase chlorite rutile sericite K-feldspar gold	30 ? 1 1 tr tr r
HC-24	pyrite chalcopyrite	5 tr	colourless, fine to very fine-grained	60	very fine-grained, red-brown	1	plagioclase chlorite quartz rutile sericite	15 10 7 1 tr
HC-32	pyrite chalcopyrite	3 tr	colourless and cloudy brownish, fine to very fine-grained	50		x	quartz chlorite sericite tourmaline rutile	20 15 7 3 1
HC-35	pyrite chalcopyrite	1 r.	cloudy and colourless brownish, very fine to medium-grained	25		x	sericite quartz plagioclase chlorite rutile zircon	25 20 20 7 2 r.
HC-50	pyrite chalcopyrite	5 r.	colourless to cloudy brownish,very fine to medium-grained	30	red-brown unknown	r.	quartz sericite rutile chlorite	40 20 4 r.

Table continued over

Tabular summary (cont.):

Sample #	**Sulphide**	**% ~**	**Carbonate occurrence**	**% ~**	**Fe-Ox**	**% ~**	**Other**	**% ~**
HC-51	pyrite chalcopyrite	tr r.	colourless to cloudy brownish,very fine to medium-grained	50	red-brown unknown	r.	sericite quartz chlorite rutile	20 13 10 6
HC-52	pyrite	2	colourless to cloudy very fine to fine-grained	10	red-brown unknown	r.	quartz sericite rutile ?clay/chlorite	80 6 1 tr
HC-53	pyrite	tr	colourless to cloudy brownish, very fine to fine-grained	tr		x	quartz sericite rutile ?clay/chlorite tourmaline	99 tr tr tr r.
HC-55	pyrite chalcopyrite unknown	1 tr r.	colourless to cloudy brownish, fine to very fine-grained	50		x	quartz chlorite sericite plagioclase rutile tourmaline	25 10 10 2 1 r.

tr = trace (< 1%); r. = rare; x = none observed; fine-grained = > 0.05 mm and < 1 mm; very fine-grained = < 0.05 mm; Fe-ox = iron and/or Fe-Ti-oxides, includes amorphous, very fine-grained poorly crystalline and/or crystalline ferric hydroxides, oxides, oxyhydroxides, hydroxy-sulphate and/or oxyhydroxy-sulphate minerals

Project: Hope Bay **Deposit:** Madrid **Zone:** Suluk
Rock Type: Mafic volcanic with sediments: Flow basalt with interflow chert/argillite/sandstone
Sample ID: HC-17 **Offcut #**: AP-1

Crushed Rock and Offcut Mount Description:
Fine to coarse angular chips (less than 9 mm size). Chips comprise mostly dark grey, lesser greenish-grey and pale grey very fine-grained rock with texture varying from massive to foliated. Traces of fine-grained pyrite occurs disseminated. Reaction of chips to cold dilute HCl. No reaction of chips to magnet. No reaction of rock chips to etching with HF and staining with sodium cobaltinitrite (no yellow stain).

Polished Thin Section Description:
Fine to coarse chips representing altered and variably deformed rock: 1) fine to very fine-grained, intensely foliated rutile-chlorite± carbonate aggregate locally with bands of fine to very fine-grained quartz-carbonate ±chlorite aggregate, 2) fine to very fine-grained massive quartz-carbonate aggregate and 3) minor patchy very fine-grained sericite±chlorite-carbonate aggregate. A number of irregular stringers of fine to medium-grained carbonate and less commonly fine-grained quartz-carbonate occur in many of the chips. Chlorite comprises approximately 40% of the section as very fine-grained aggregates. Major rutile, approximately 8%, occurs as very fine-grained aggregates within the foliation and replacing fine-grained disseminated tabular forms. Quartz, approximately 8%, occurs as fine to very fine-grained (< 0.2 mm) patchy, anhedral aggregates commonly with undulose extinction. Locally quartz occurs as very fine-grained pressure fringes to pyrite grains in foliated rock fragments. Sericite occurs in minor amounts, ~ 1%, as very fine-grained flaky aggregates. Traces of feldspar occur within rock fragments with quartz-carbonate aggregate and sericite±chlorite-carbonate aggregate.

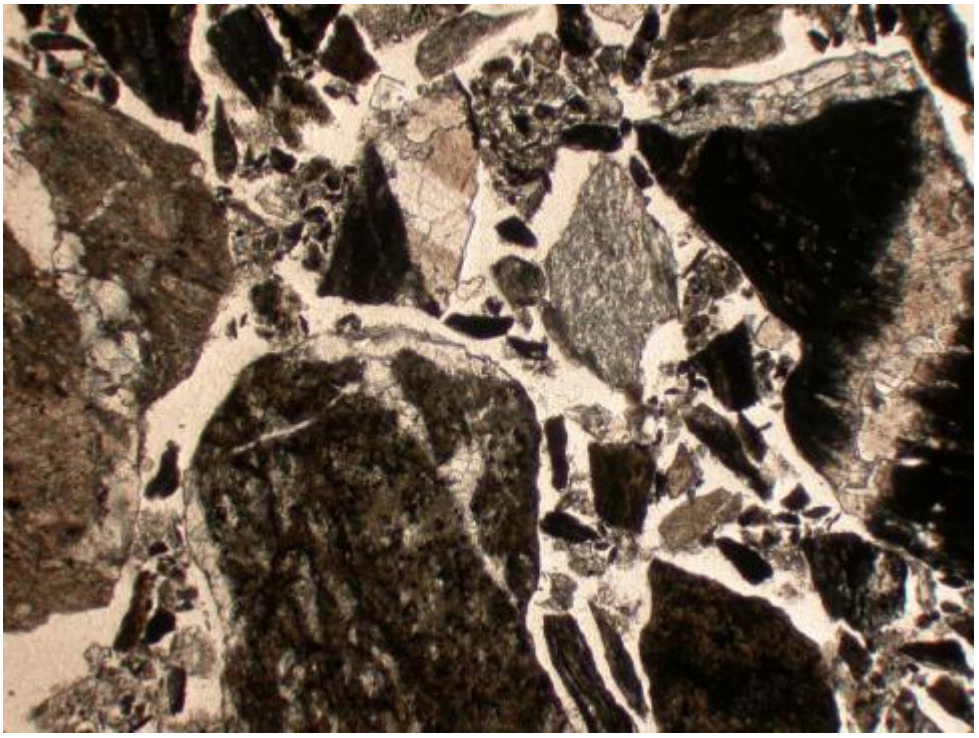
Carbonate occurs in major amounts (~40%) as colourless carbonate in the following forms: 1) fine to very fine-grained (< 0.1 mm), anhedral aggregates within foliated rutile-chlorite-carbonate fragments, 2) fine to very fine-grained (< 0.6 mm), anhedral aggregates within quartz-carbonate aggregate, 3) very fine-grained aggregate associated with sericite-bearing fragments, 4) fine-grained (< 0.8 mm) anhedral aggregates within carbonate stringers and 5) as fine-grained liberated grains (< 0.7 mm). Note some of the carbonate within quartz-carbonate aggregate and rutile-chlorite-carbonate fragments is strained with local development of undulatory extinction and subgrains. Some of the carbonate is calcite based on reaction of crushed rock to cold, dilute HCl.

Sulphide occurs in minor amounts (~2%) as pyrite and in trace amounts as chalcopyrite. Pyrite grains are fine to very fine grained (< 0.3 mm) and occur as disseminated to patchy sub-anhedral grains and aggregate in altered rock fragments and as liberated anhedral grains and aggregate. Some pyrite grains are highly fractured. Pyrite grains have irregular to straight grain boundaries which are unaltered. Traces of fine to very fine-grained (< 0.2 mm) chalcopyrite occur disseminated in rock fragments, as anhedral aggregates associated with pyrite and as inclusions in pyrite.

Tabular summary (visual estimate):

Sample # -	**Sulphide**	**% ~**	**Carbonate occurrence**	**% ~**	**Fe-Ox**	**% ~**	**Other**	**% ~**
HC-17	pyrite	2	colourless, fine to very fine-grained	40		x	chlorite	40
	chalcopyrite	tr					quartz	8
							rutile	8
							sericite	1
							feldspar	tr

Abbreviations: tr = trace (< 1%); r. = rare; x = none observed
-fine-grained = > 0.05 mm and < 1 mm; very fine-grained = < 0.05 mm; medium-grained = 1-5 mm
-Fe-ox = iron and/or Fe-Ti-oxides, includes amorphous, very fine-grained poorly crystalline and/or crystalline ferric hydroxides, oxides, oxyhydroxides, hydroxy-sulphate and/or oxyhydroxy-sulphate minerals



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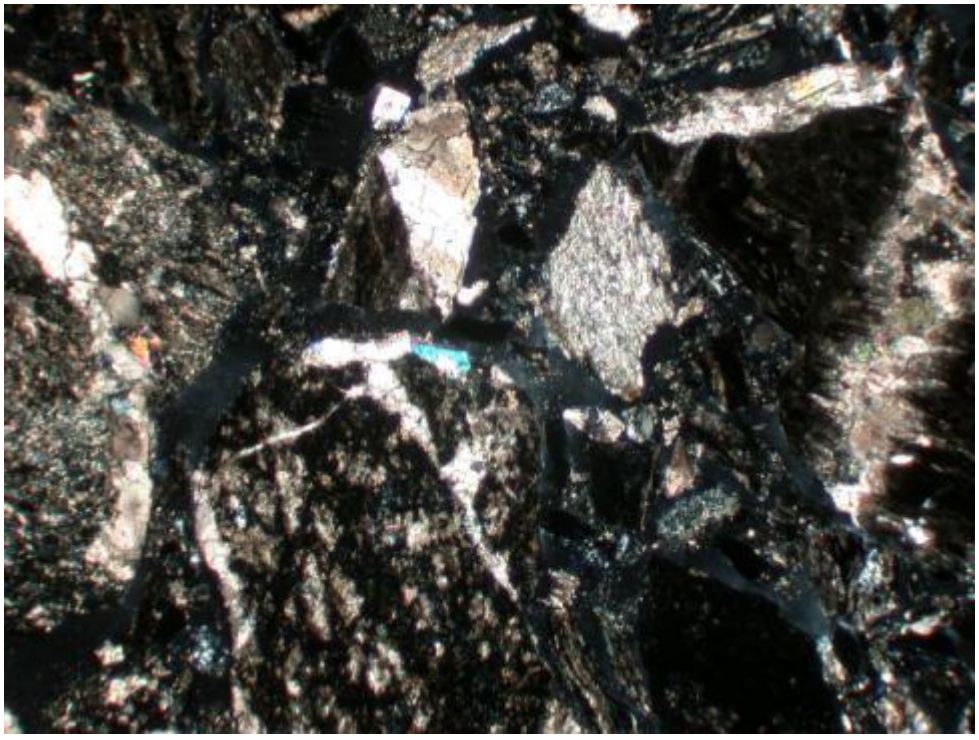
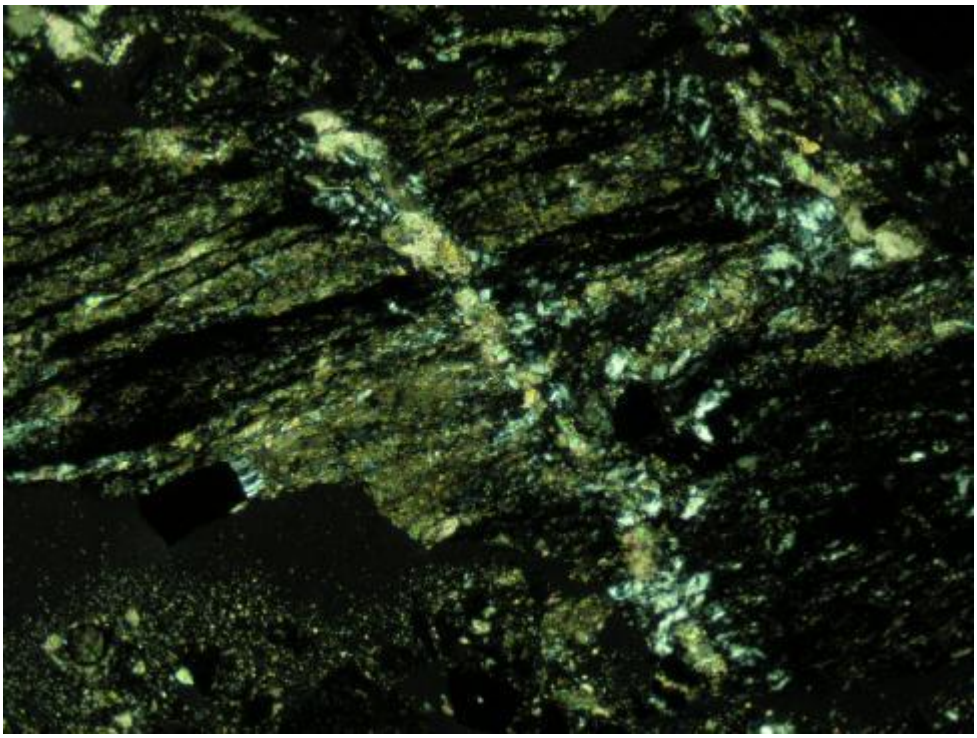


B

HC-17: A&B) View of altered and deformed rock rock chips represented by intensely foliated rutile-chlorite± carbonate aggregate locally with bands of fine to very fine-grained quartz-carbonate ±chlorite aggregate and minor sericite±chlorite-carbonate aggregate cut by irregular stringers of fine carbonate. A) PPL, B) XPL, FOV =~ 4.5 mm.



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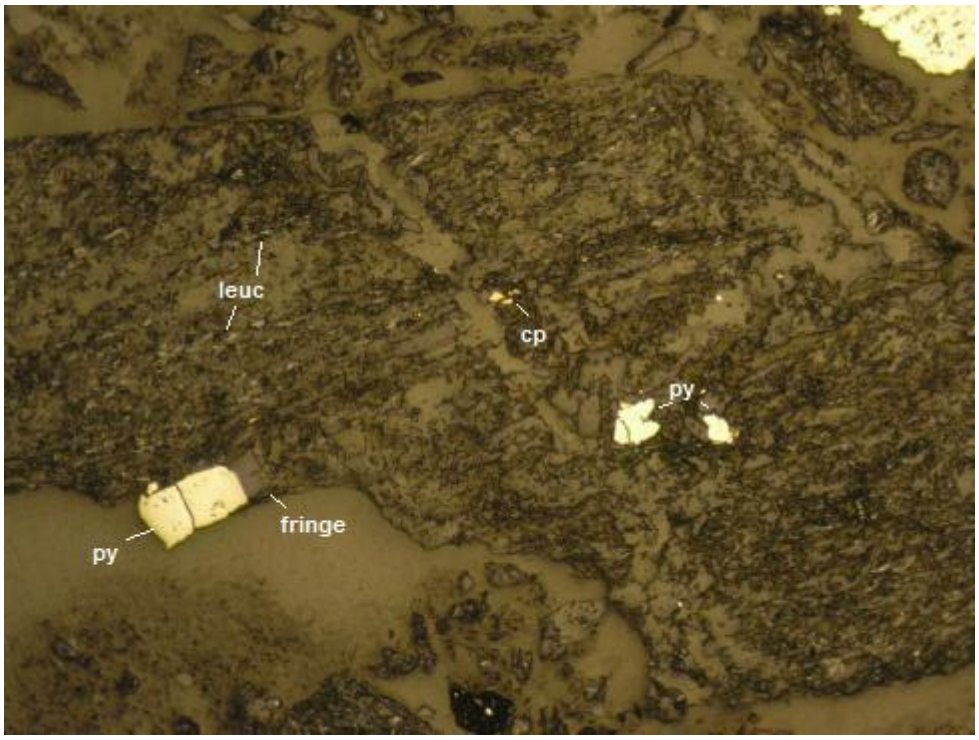
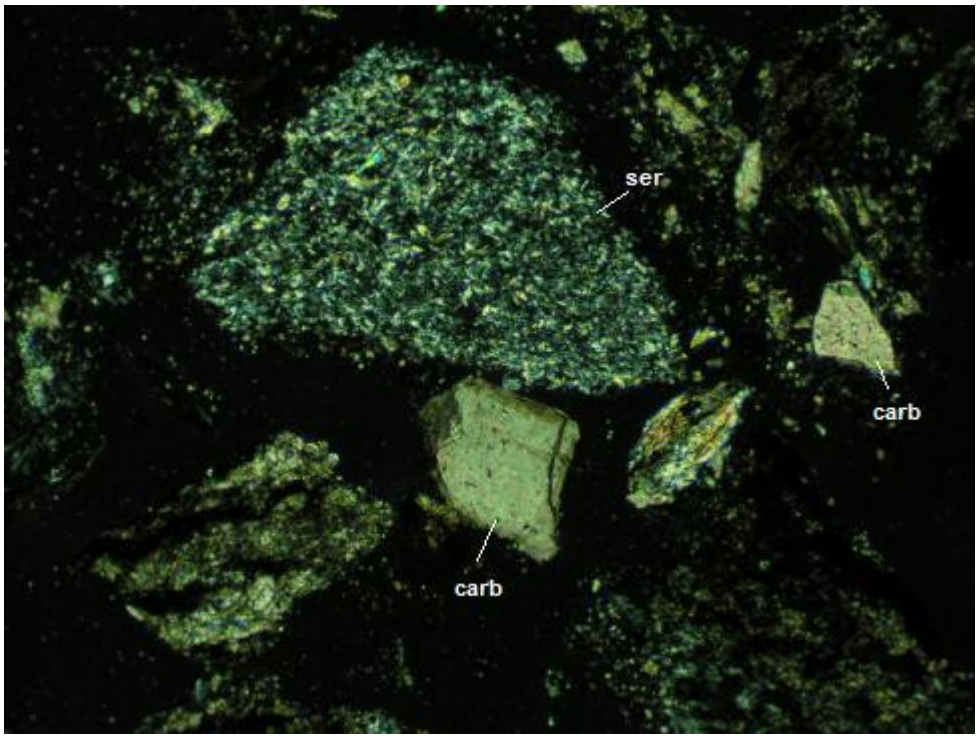


D

HC-17: C&D) Detailed view of foliated rutile-chlorite-carbonate rock fragment cut by carbonate-quartz stringers. Note disseminated pyrite and chalcopyrite. Note pyrite with pressure fringe (left). C) XPL, D) RL, FOV =~ 2.6 mm



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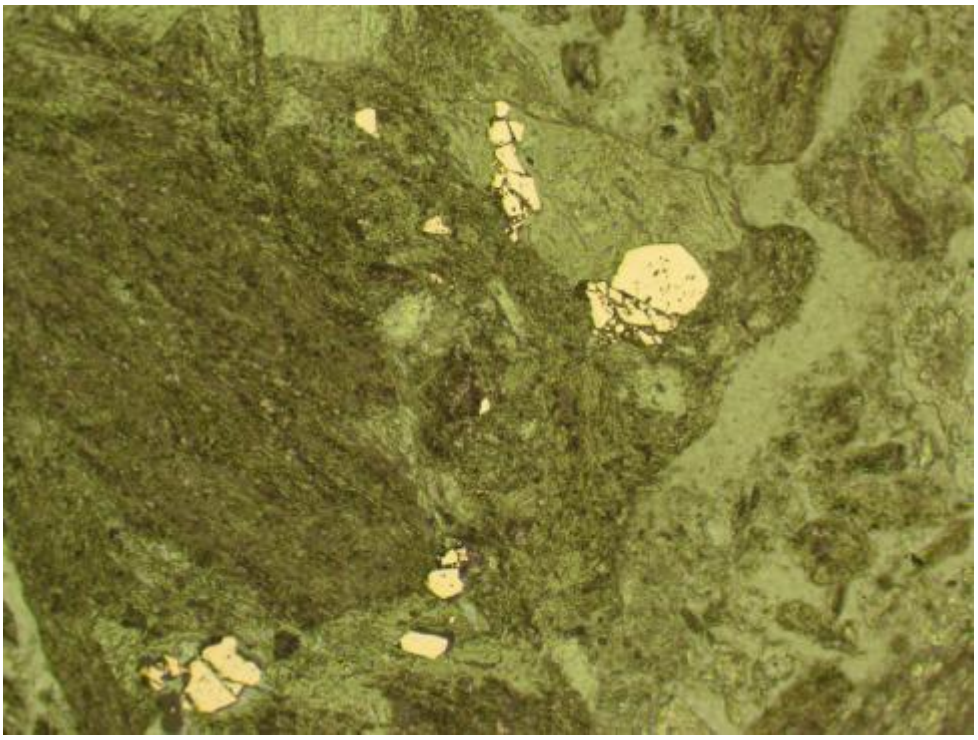


F

HC-17: E) Overview of sericite-altered rock fragment (ser), rutile-chlorite-carbonate rock fragments and liberated carbonate grains (carb). XPL, FOV =~ 1.3 mm. F) Fractured anhedral pyrite grains within rutile-chlorite-carbonate rock fragment. PPL+RL, FOV =~ 1.3 mm.

Project: Hope Bay **Deposit:** Madrid **Zone:** Naartok E
Rock Type: Sedimentary units: Argillite
Sample ID: HC-20 **Offcut #**: AP-2

Crushed Rock and Offcut Mount Description:
Fine to coarse angular chips (less than 9 mm size). Chips comprise dark grey fine-grained rock locally with white siliceous patches. Major disseminated fine-grained pyrite. No reaction of chips to cold dilute HCl. No reaction of chips to magnet. Reaction of rock chips to etching with HF and staining with sodium cobaltinitrite (traces of yellow stain).

Polished Thin Section Description:
Fine to coarse chips representing massive, pyritic rock comprising plagioclase-quartz-carbonate(±chlorite±rutile) aggregate. Quartz occurs as fine-grained, irregular anhedral grains and patchy aggregates (up to 1 mm size) and as very fine-grained aggregates. Fine quartz grains display undulatory extinction and development of subgrains. Locally quartz occurs as very fine-grained pressure fringes to pyrite grains. The amount of quartz in the section is estimated at 30%. Plagioclase, likely mostly albite, occurs as fine-grained (< 0.3 mm) scattered tabular grains and as patchy very fine-grained aggregates with quartz. The amount of plagioclase in the section cannot be estimated accurately optically. Carbonate occurs as fine to very fine-grained anhedral aggregates within rock fragments (as described below) and rarely in veinlets with quartz. In a few fragments, minor chlorite, ~1%, occurs as very fine-grained aggregates associated with rutile aggregate. Rutile occurs in minor amounts, ~1%, in the section, disseminated as very fine-grained anhedral aggregates and in acicular form. Sericite occurs in trace amounts as very fine-grained flaky aggregates in pyrite pressure fringes and locally as fine ribbons with chlorite. K-feldspar occurs in trace amounts with patchy distribution in some fragments (based on stained offcut).

Carbonate occurs in major amounts (~50%) as colourless to cloudy brownish carbonate in the following forms: 1) fine to very fine-grained (< 0.5 mm), anhedral aggregates within quartz-carbonate aggregate, 2) fine-grained (< 0.4 mm) anhedral aggregates within carbonate±quartz veinlets and 3) as fine-grained liberated grains (< 0.25 mm). Note some of the carbonate within quartz-carbonate aggregate is strained with local development of undulatory extinction and subgrains.

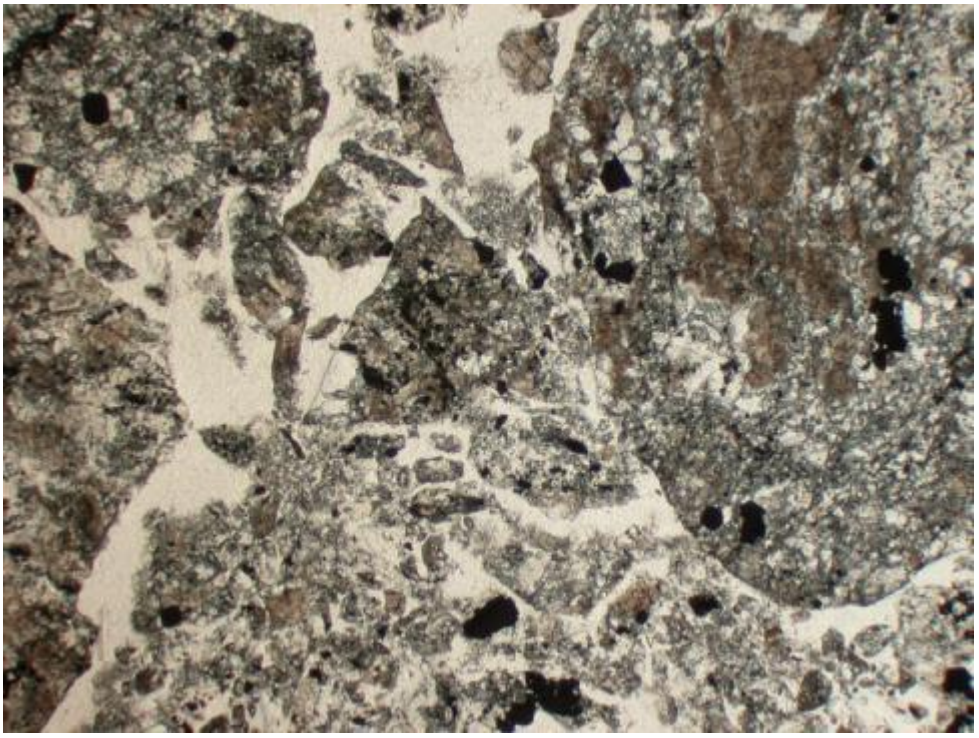
Sulphide occurs in major amounts (~5%) as pyrite and rarely as chalcopyrite, an unknown phase and sphalerite. Pyrite grains are fine to very fine grained (< 0.4 mm) and occur as disseminated to patchy eu-anhedral grains and aggregate in altered rock fragments and as liberated grains and aggregate. Pyrite grains have irregular to straight grain boundaries which are unaltered. Rare very fine-grained chalcopyrite occurs disseminated in rock fragments as inclusions in pyrite and as liberated grains. Rare very fine-grained sphalerite occurs as inclusions in pyrite. Rare traces of a very fine-grained, unknown, highly reflective phase (light grey in reflected light, isotropic) occur as aggregates associated with pyrite and as inclusions in pyrite. Rare traces of very fine-grained (~5 µm) gold grains are observed as inclusions in pyrite.

Project: Hope Bay **Deposit:** Madrid **Zone:** Naartok E
Rock Type: Sedimentary units: Argillite
Sample ID: HC-20 **Offcut #**: AP-2

Tabular summary (visual estimate):

Sample # -	**Sulphide**	**% ~**	**Carbonate occurrence**	**% ~**	**Fe-Ox**	**% ~**	**Other**	**% ~**
HC-20	pyrite	5	colourless to cloudy brownish, fine to very fine-grained	50		x	quartz	30
	chalcopyrite	r					plagioclase	?
	unknown	r					chlorite	1
	sphalerite	r					rutile	1
							sericite	tr
							K-feldspar	tr
							gold	r

Abbreviations: tr = trace (< 1%); r. = rare; x = none observed
-fine-grained = > 0.05 mm and < 1 mm; very fine-grained = < 0.05 mm; medium-grained = 1-5 mm
-Fe-ox = iron and/or Fe-Ti-oxides, includes amorphous, very fine-grained poorly crystalline and/or crystalline ferric hydroxides, oxides, oxyhydroxides, hydroxy-sulphate and/or oxyhydroxy-sulphate minerals



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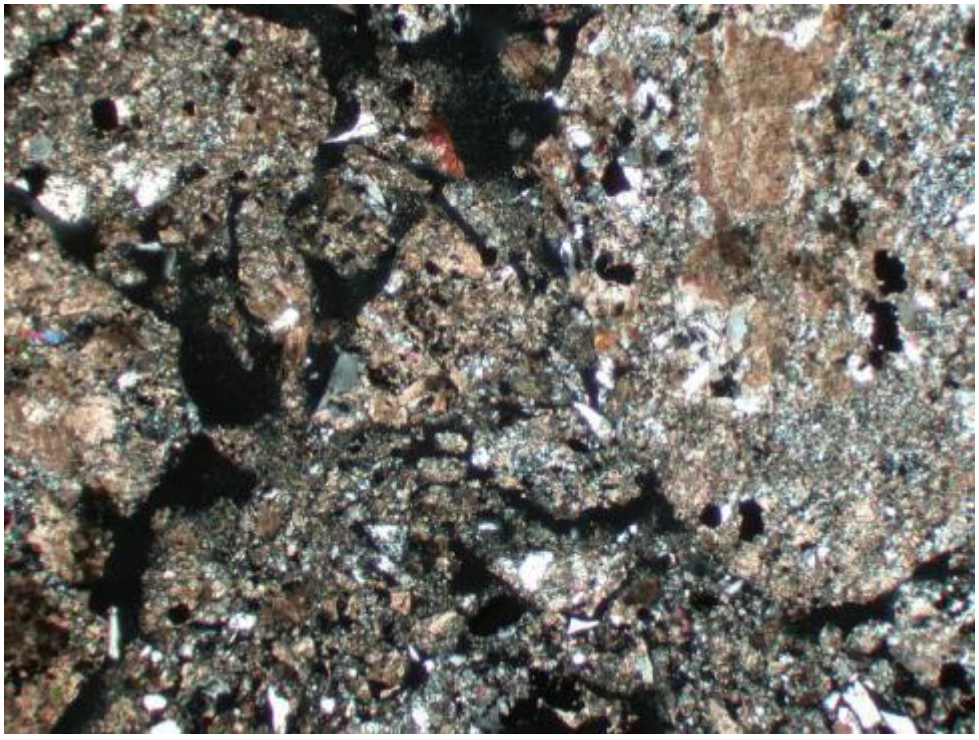
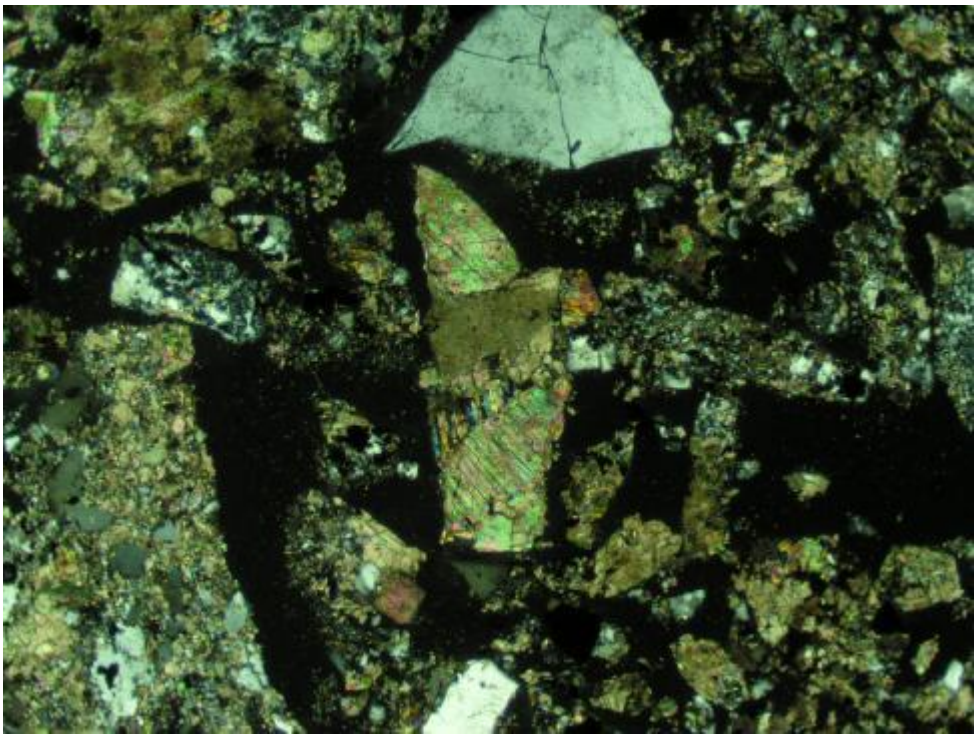


B

HC-20: A&B) View of pyritic rock comprising plagioclase-quartz-carbonate(±chlorite±rutile) aggregate. A) PPL, B) XPL, FOV =~ 4.5 mm.



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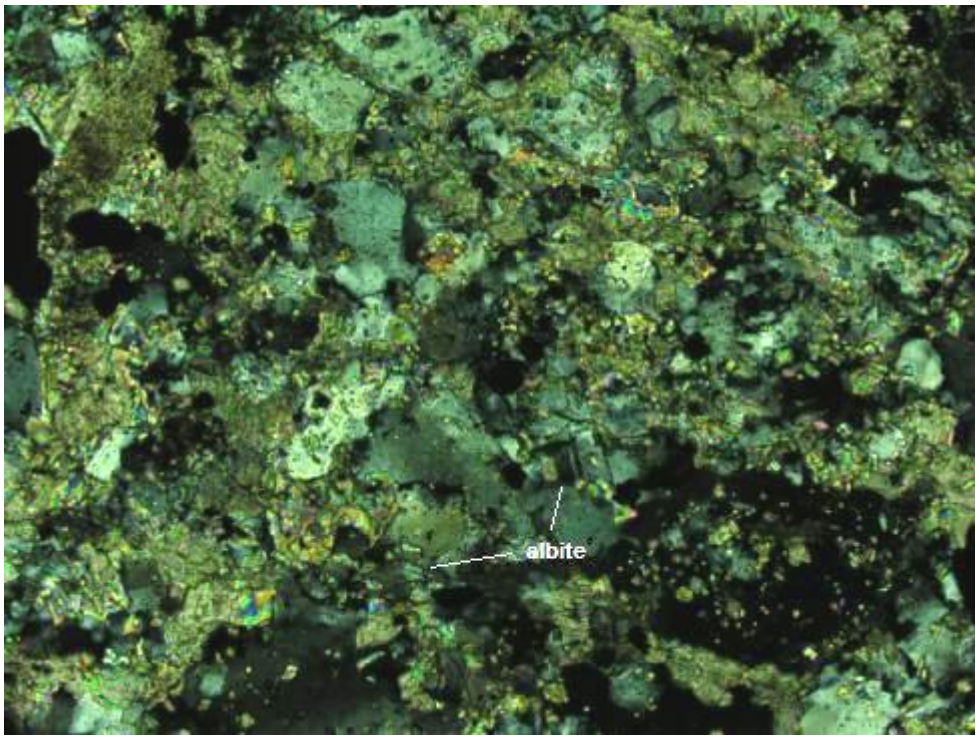
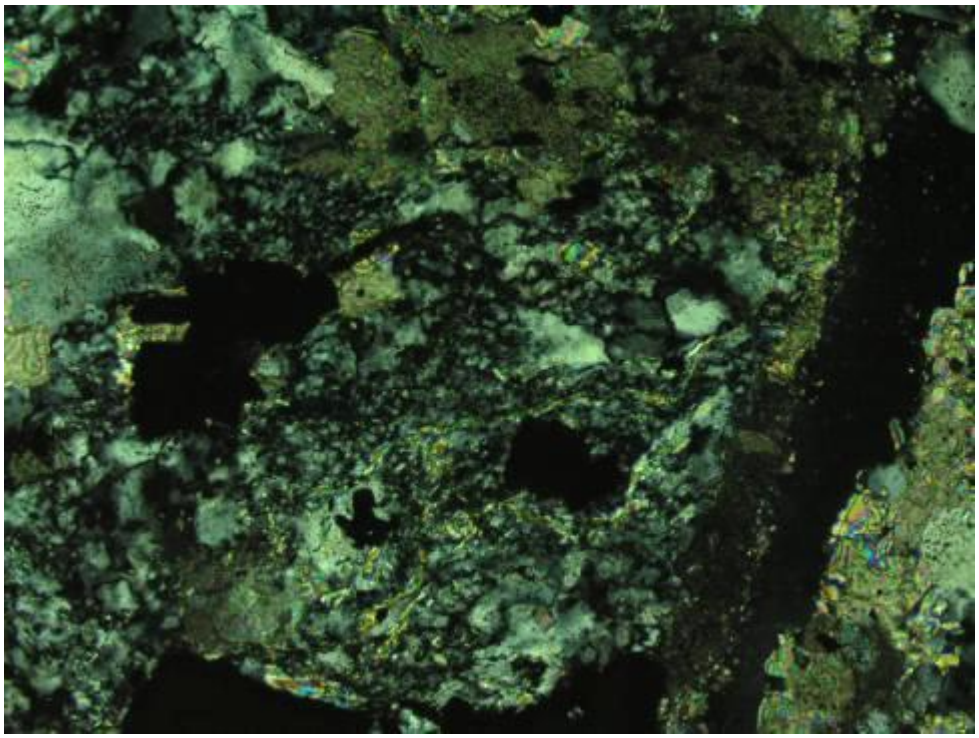


D

HC-20: C) Liberated fine carbonate aggregate (centre). XPL, FOV =~ 2.6 mm. D) Detailed view of plagioclase (albite)-quartz-carbonate aggregate. XPL, FOV =~ 1.3 mm



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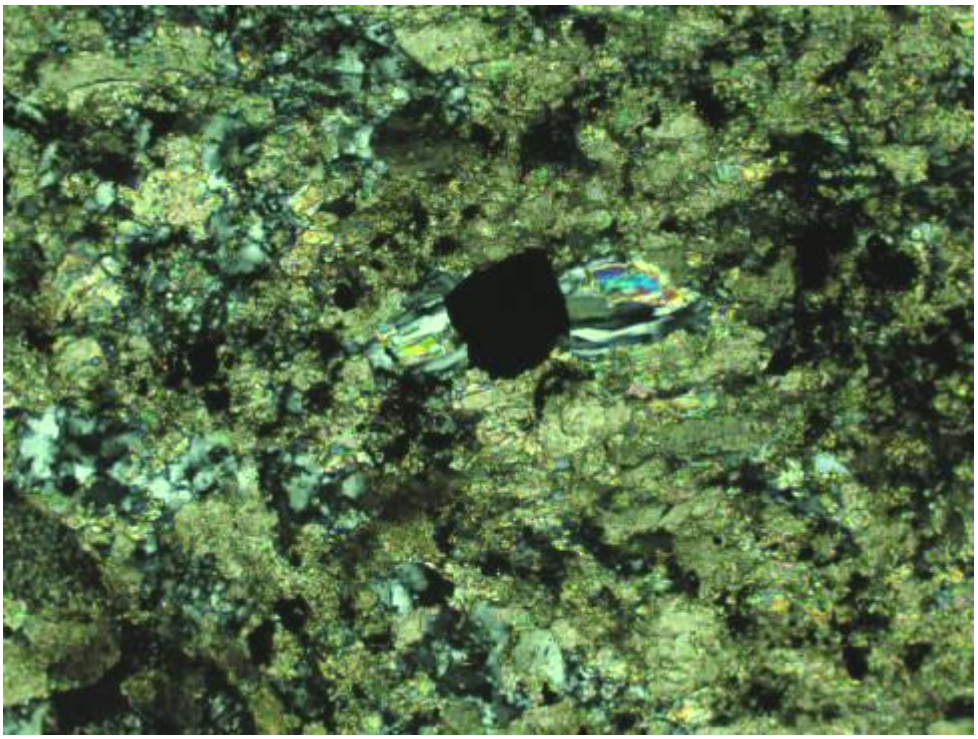
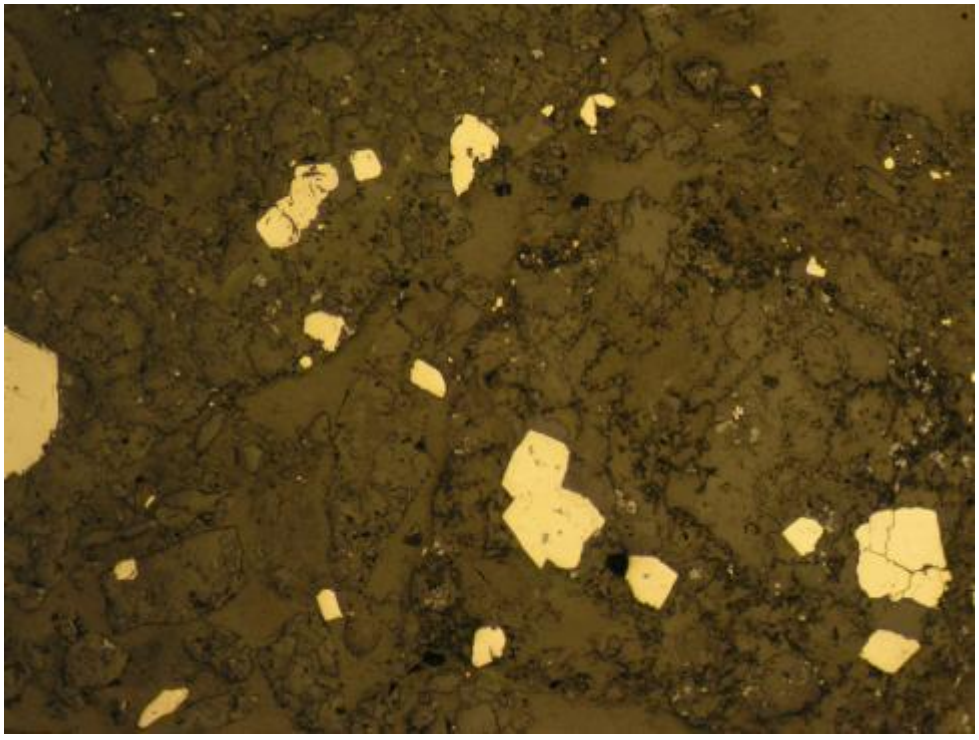


F

HC-20: E) Ribbons of sericite-chlorite within albite-quartz-carbonate aggregate. XPL, FOV =~ 0.7 mm. F) Pyrite grain (opaque, centre) with quartz-sericite pressure fringe. XPL, FOV =~ 1.3 mm.



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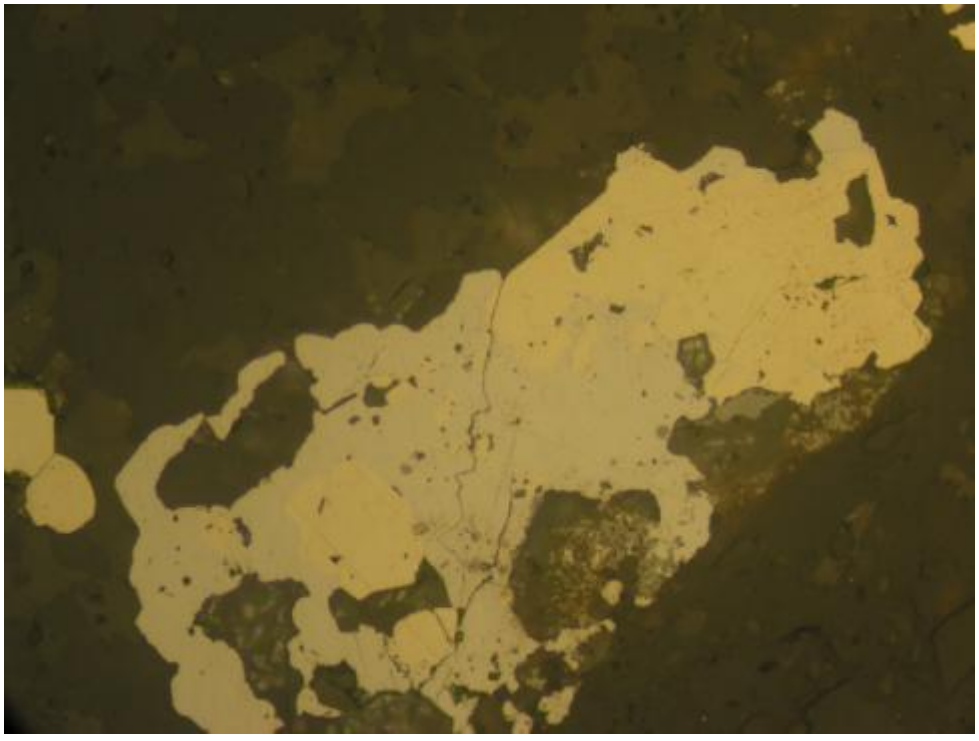
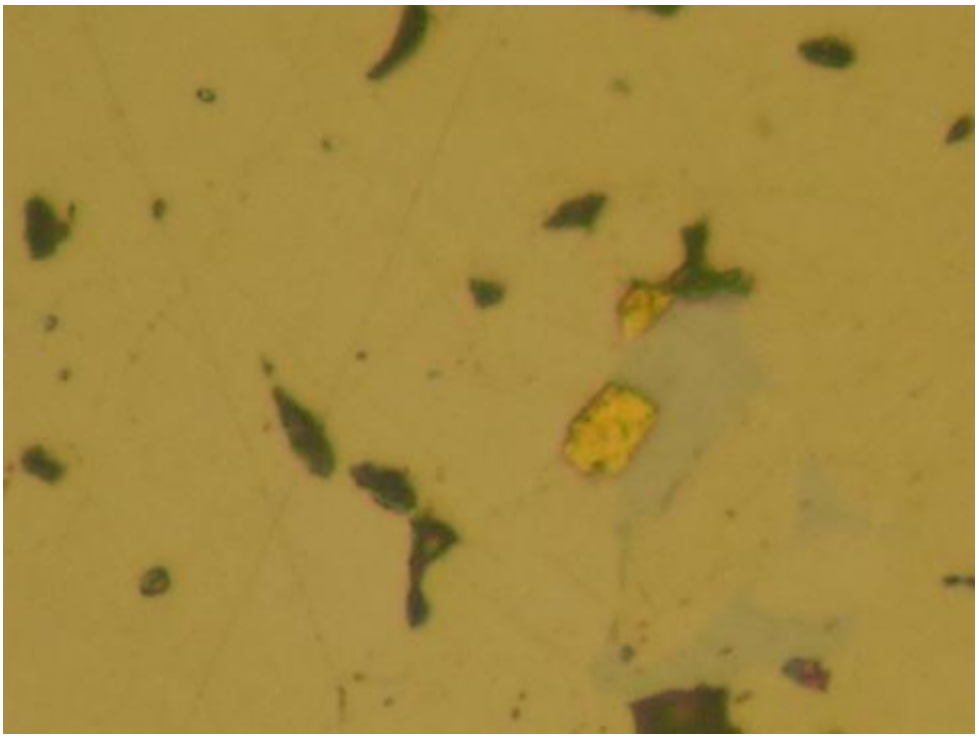


H

HC-20: G) Overview of disseminated pyrite within section. RL, FOV =~ 2.6 mm. H) Pyrite and unknown aggregate (light grey). RL, FOV =~ 1.3 mm.


I

HC-20: I) Inclusions of gold (bright yellow) associated with unknown phase (light grey) within pyrite (yellowish-white). RL, FOV =~ 0.08 mm.

Project: Hope Bay **Deposit:** Madrid **Zone:** Naartok E
Rock Type: Mafic volcanic: C-type
Sample ID: HC-24 **Offcut #**: AP-3

Crushed Rock and Offcut Mount Description:
Fine to coarse angular chips (less than 8 mm size). Chips comprise dark grey, olive-brown and lesser brown very fine-grained rock and white granular carbonate aggregate. Minor fine-grained pyrite occurs locally disseminated. No reaction of chips to cold dilute HCl. No reaction of chips to magnet. Minor, ~1%, red-brown stain of some rock chips. Reaction of brown-stained rock chips to etching with HF and staining with sodium cobaltinitrite (minor yellow and strong orange stain).

Polished Thin Section Description:
Fine to coarse chips representing variably altered rock: 1) fine-grained plagioclase laths forming massive aggregate with patchy carbonate alteration, bands of and disseminated very fine-grained rutile and disseminated pyrite grains (note very fine-grained sericite can occur as ribbons in some chips and carbonate can occur in excess of plagioclase in some chips), 2) fine to very fine-grained albite-quartz-carbonate aggregate, 3) fine-grained massive quartz-carbonate aggregate, 4) fine-grained carbonate aggregate with very fine-grained sericite occurs as patchy aggregates in some chips, 5) very fine-grained carbonate with bands of graphite±rutile and chlorite, 6) fine to very fine-grained pyrite aggregate. Chlorite comprises ~ 10% of the section as very fine-grained aggregates. Rutile occurs in minor amounts, ~1%, disseminated as very fine-grained anhedral aggregates, in acicular form and replacing tabular forms. Quartz, ~ 7%, occurs as fine to very fine-grained (< 0.4 mm) patchy, anhedral aggregates commonly with undulose extinction. Sericite occurs in trace amounts as flaky aggregates forming patches and ribbons. Plagioclase, ~15%, occurs as fine-grained laths (< 0.3 mm) and as fine to very fine albite (< 0.3 mm) within altered rock aggregates.

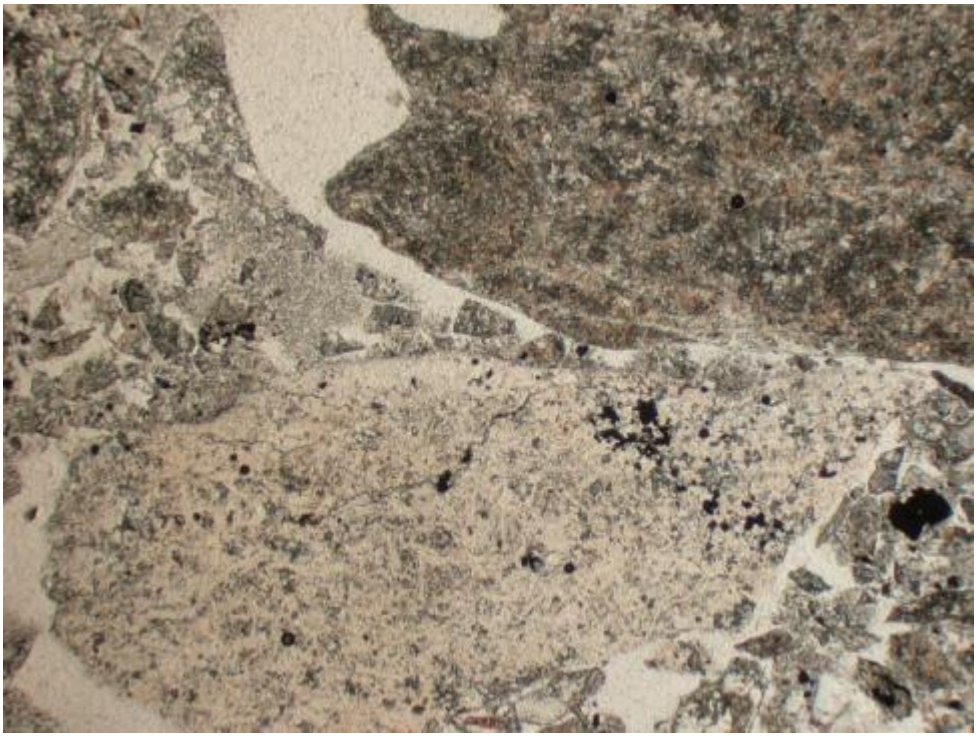
Carbonate occurs in major amounts (~60%) as colourless carbonate in the following forms: 1) fine to very fine-grained (< 0.3 mm), anhedral aggregates as replacement of rock fragments, 2) fine to very fine-grained (< 0.6 mm) anhedral aggregates within quartz-carbonate and carbonate aggregate, and 3) as fine-grained liberated grains (< 0.6 mm). Note some of the carbonate within quartz-carbonate aggregate is strained with local development of undulatory extinction and subgrains. Note that Fe-ox, occurs as very fine-grained, red-brown unknown aggregates replacing carbonate in minor amounts, ~1%, resulting in a red-brown colouration of some chips.

Sulphide occurs in major amounts (~5%) as pyrite and in trace amounts as chalcopyrite. Pyrite grains are fine to very fine grained (< 0.25 mm) and occur disseminated, as clusters and in patchy sub-anhedral grains and aggregate in altered rock fragments and as liberated anhedral grains and aggregate. Some pyrite grains are strongly pitted. Pyrite grains have irregular to straight grain boundaries which are unaltered. Traces of fine to very fine-grained (< 0.2 mm) chalcopyrite occur disseminated in rock fragments, as anhedral grains associated with pyrite, as infill to pyrite and as inclusions in pyrite.

Tabular summary (visual estimate):

Sample # -	**Sulphide**	**% ~**	**Carbonate occurrence**	**% ~**	**Fe-Ox**	**% ~**	**Other**	**% ~**
HC-24	pyrite	5	colourless, fine to	60	very fine-grained,	1	plagioclase	15
	chalcopyrite	tr	very fine-grained		red-brown		chlorite	10
							quartz	7
							rutile	1
							sericite	tr

Abbreviations: tr = trace (< 1%); r. = rare; x = none observed
-fine-grained = > 0.05 mm and < 1 mm; very fine-grained = < 0.05 mm; medium-grained = 1-5 mm
-Fe-ox = iron and/or Fe-Ti-oxides, includes amorphous, very fine-grained poorly crystalline and/or crystalline ferric hydroxides, oxides, oxyhydroxides, hydroxy-sulphate and/or oxyhydroxy-sulphate minerals



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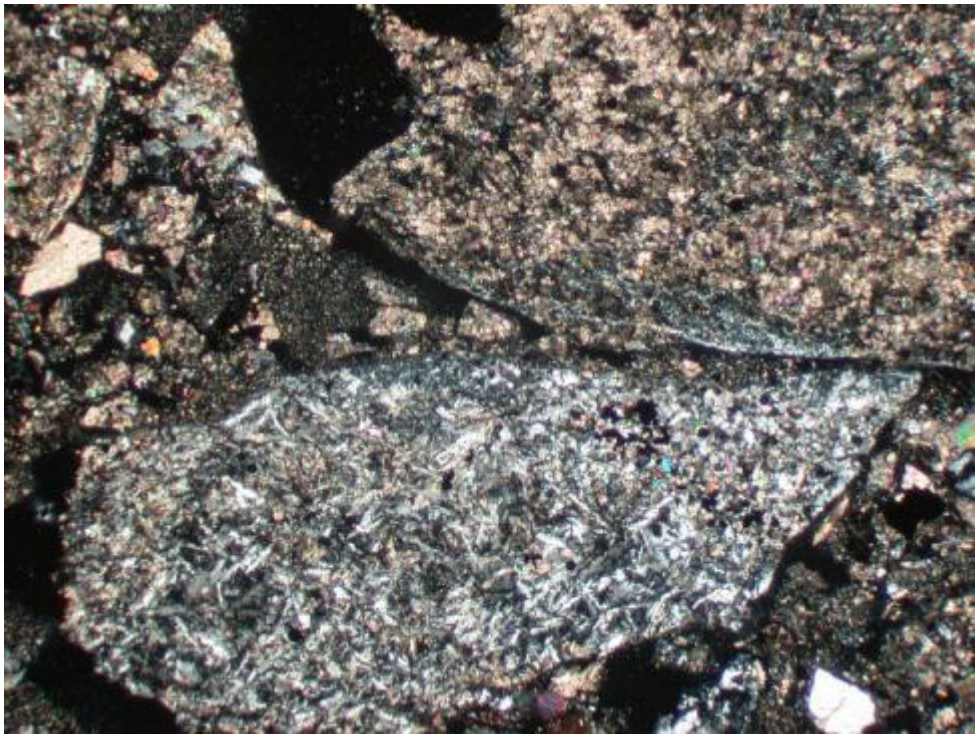
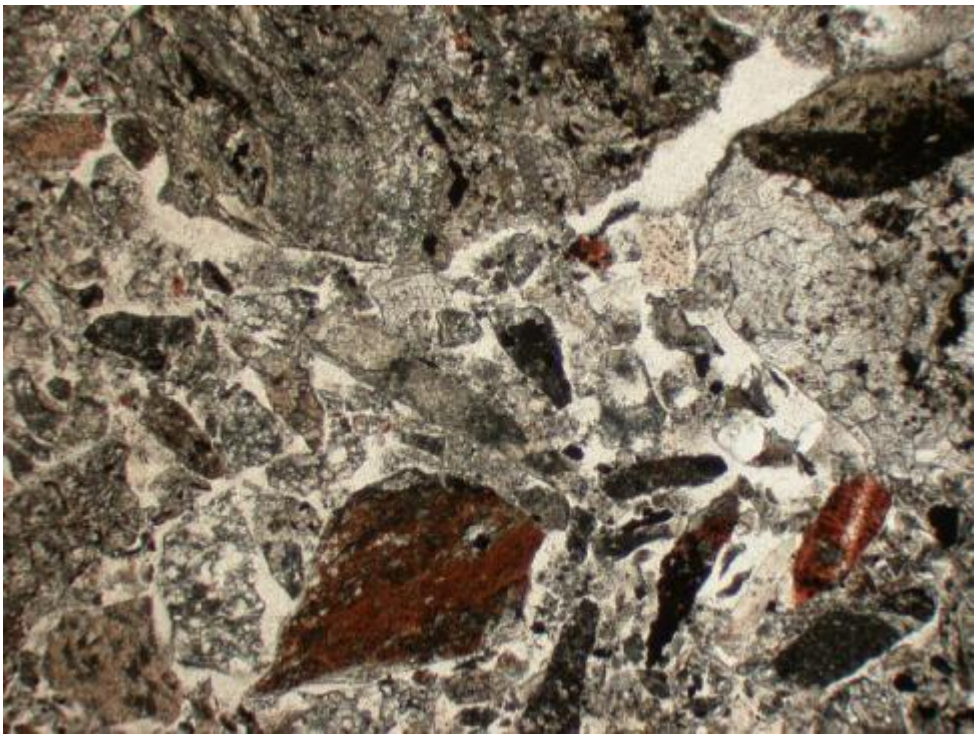
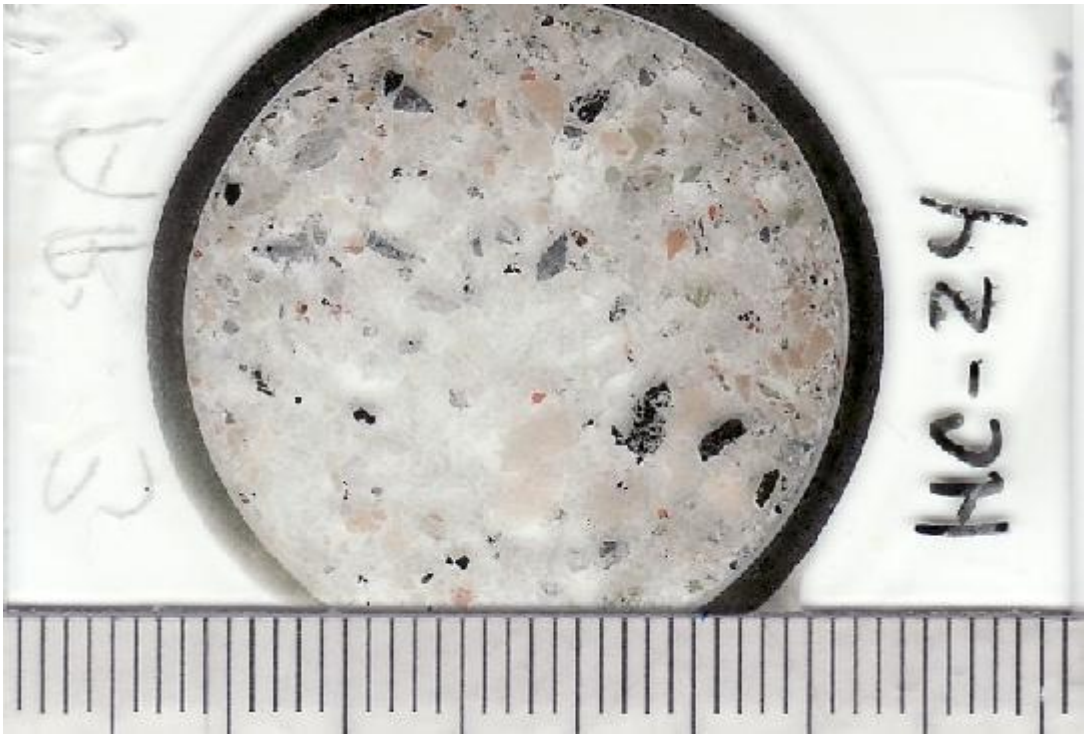


B

HC-24: A&B) View of altered rock rock chips represented by fine-grained plagioclase laths forming aggregate partly replaced by carbonate (bottom of photo) and chlorite-carbonate aggregate with sericite ribbons (top). A) PPL, B) XPL, FOV =~ 4.5 mm.

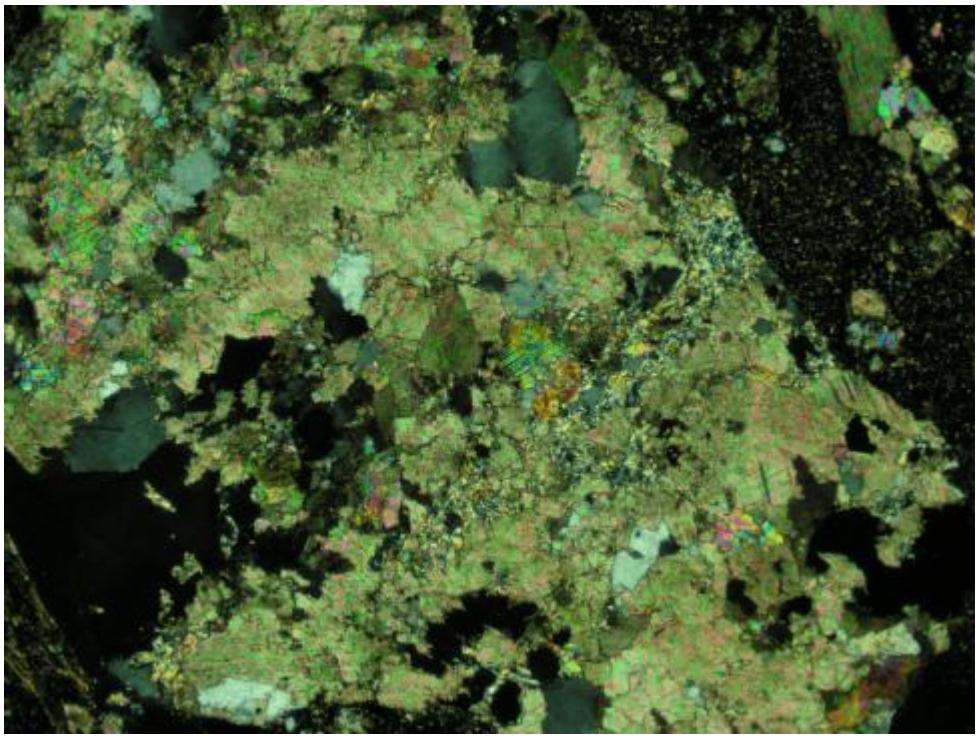


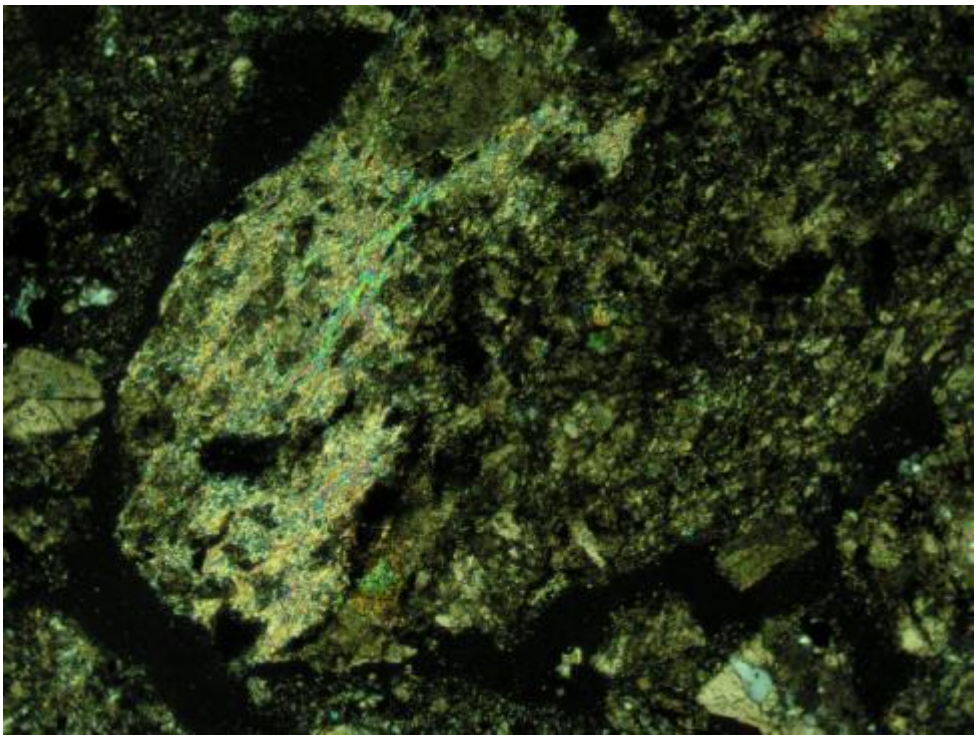
C



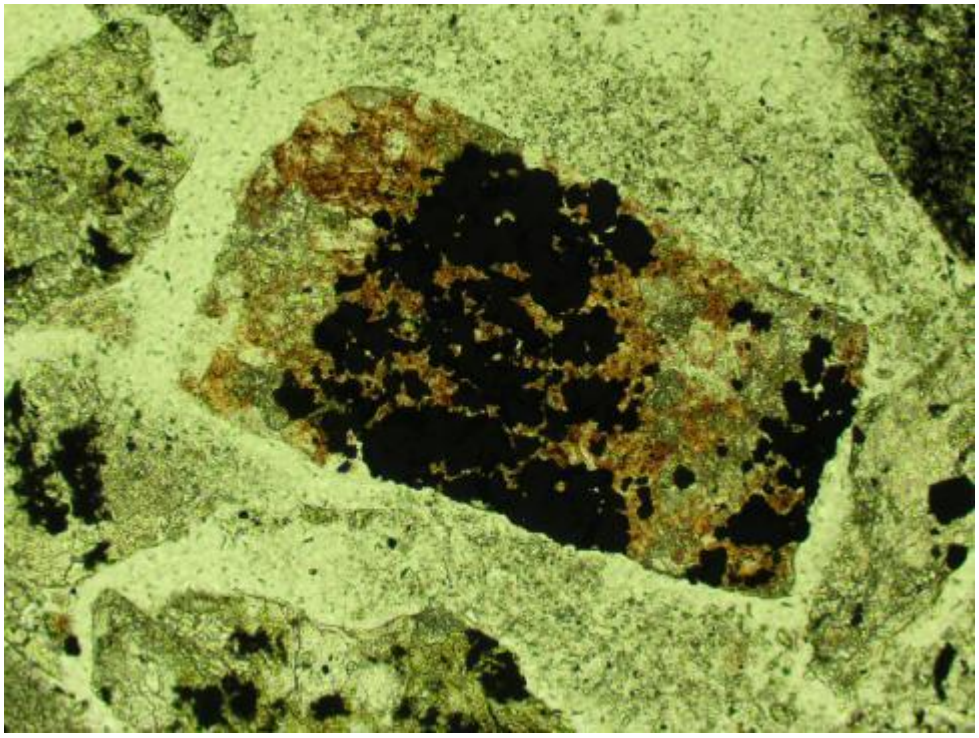
D

HC-24: C&D) Fe-ox as very fine-grained red-brown aggregates replacing carbonate in minor amounts, ~1%, resulting in a red-brown colouration of some chips. C) PPL, FOV =~ 4.5 mm, D) scan of section, FOV = 4.7 cm.

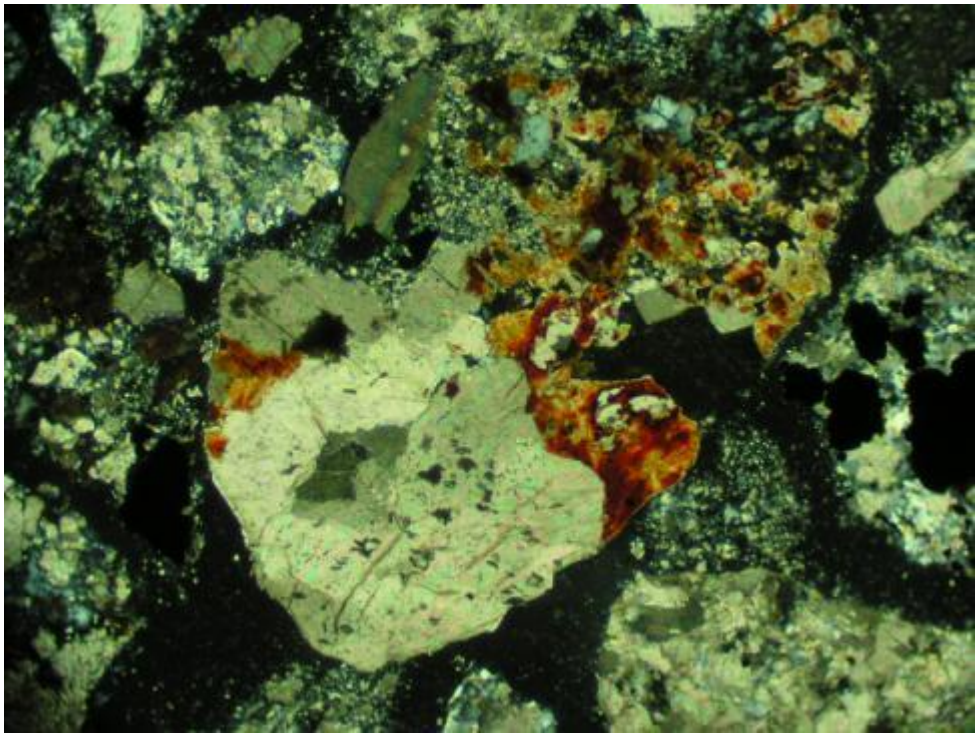

E


F

HC-24: E) Quartz-carbonate aggregate with patchy sericite. XPL, FOV =~ 2.6 mm. F) Fine-grained carbonate with patchy sericite aggregate. XPL, FOV =~ 2.6 mm.

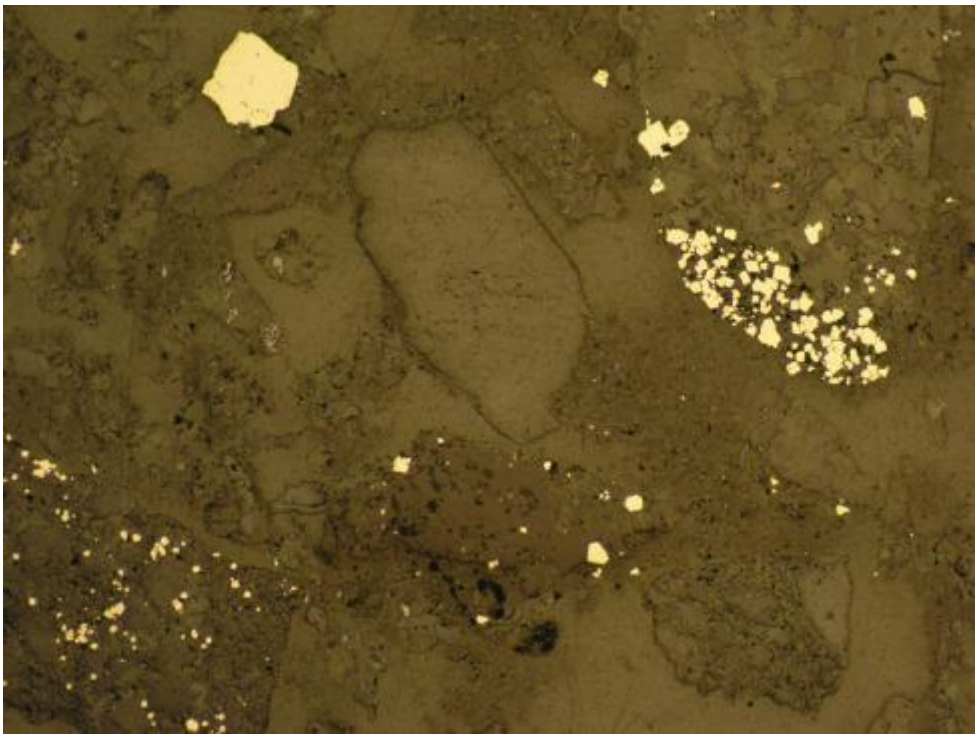


G

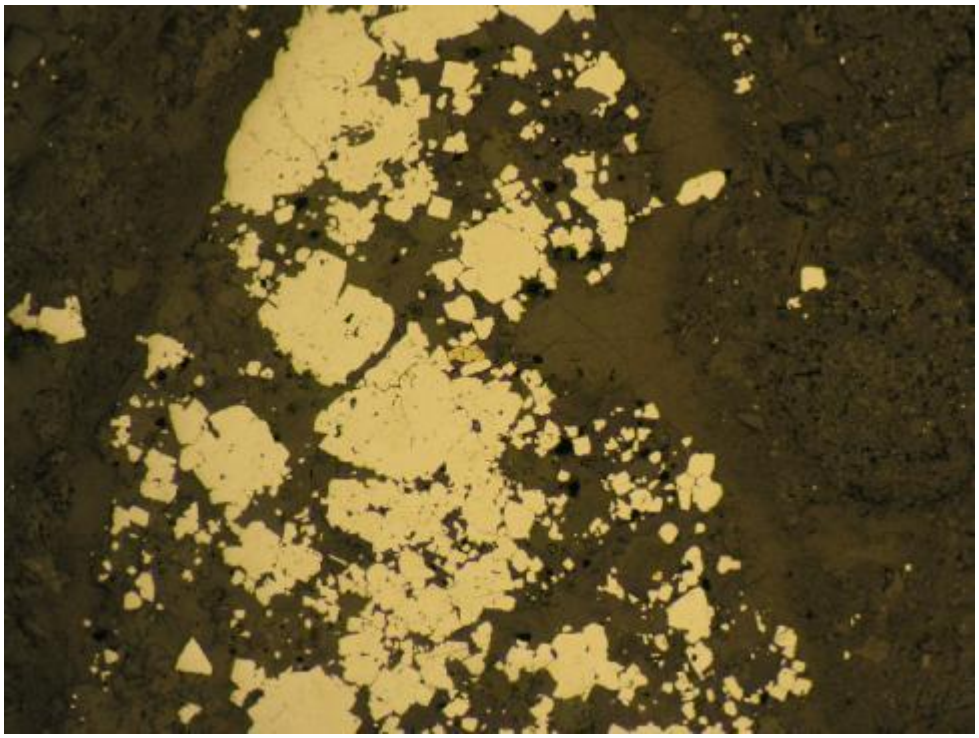


H

HC-24: G) Fragment of chlorite-opaques (pyrite)-carbonate with carbonate partly replaced by red-brown Fe-ox aggregate. PPL, FOV =~ 1.3 mm. H) Patchy carbonate aggregate partly replaced by red-brown Fe-ox. XPL, FOV =~ 1.3 mm.



I



J

HC-24: I) Representative view of pyrite distribution disseminated, in clusters and as liberated grains. RL, FOV =~ 2.6 mm. J) Cluster of pyrite aggregate with trace chalcopyrite (yellow, centre). RL, FOV =~ 1.6 mm.

Project: Hope Bay **Deposit:** Boston **Zone:** Boston
Rock Type: Mafic volcanic with sediments: Heterolithic fragmental basalt with interflow chert/argillite/sandstone
Sample ID: HC-32 **Offcut #**: AP-4

Crushed Rock and Offcut Mount Description:
Fine to coarse angular chips (less than 8 mm size). Chips comprise fine-grained greenish-grey banded rock, translucent material and white quartz vein fragments. Traces of fine-grained pyrite occurs locally disseminated. No reaction of chips to cold dilute HCl. No reaction of chips to magnet. No reaction of chips to etching with HF and staining with sodium cobaltinitrite (no yellow stain).

Polished Thin Section Description:
Fine to coarse chips representing variably altered and variably deformed rock: 1) strongly foliated, very fine-grained sericite aggregate with radiating fine tourmaline, very fine bands of rutile and disseminated pyrite, 2) fine to very fine-grained, strongly foliated and banded quartz-chlorite-rutile-sericite±carbonate and quartz-chlorite-rutile-carbonate aggregate, 3) fine to very fine-grained massive quartz-carbonate aggregate, 4) fine-grained quartz±carbonate±rarely tourmaline aggregate as vein fragments and 5) fine to medium-grained carbonate aggregate. Quartz, carbonate, tourmaline and pyrite occur as liberated grains. Chlorite comprises ~ 15% of the section as very fine-grained aggregates. Tourmaline, ~3%, occurs as fine to very fine-grained (< 0.35 mm), colourless to pale green, acicular and radiating aggregates. Rutile occurs in minor amounts, ~1%, as very fine-grained aggregates in bands, as fine disseminated grains and as patchy aggregates. Quartz, ~ 20%, occurs as very fine-grained patchy, anhedral aggregates in rock fragments and as fine to very fine anhedral aggregates < 1 mm), commonly with undulose extinction and development of subgrains, in vein fragments. Sericite, ~7%, occurs as very fine-grained anhedral aggregates developed along foliation planes forming a banded texture.

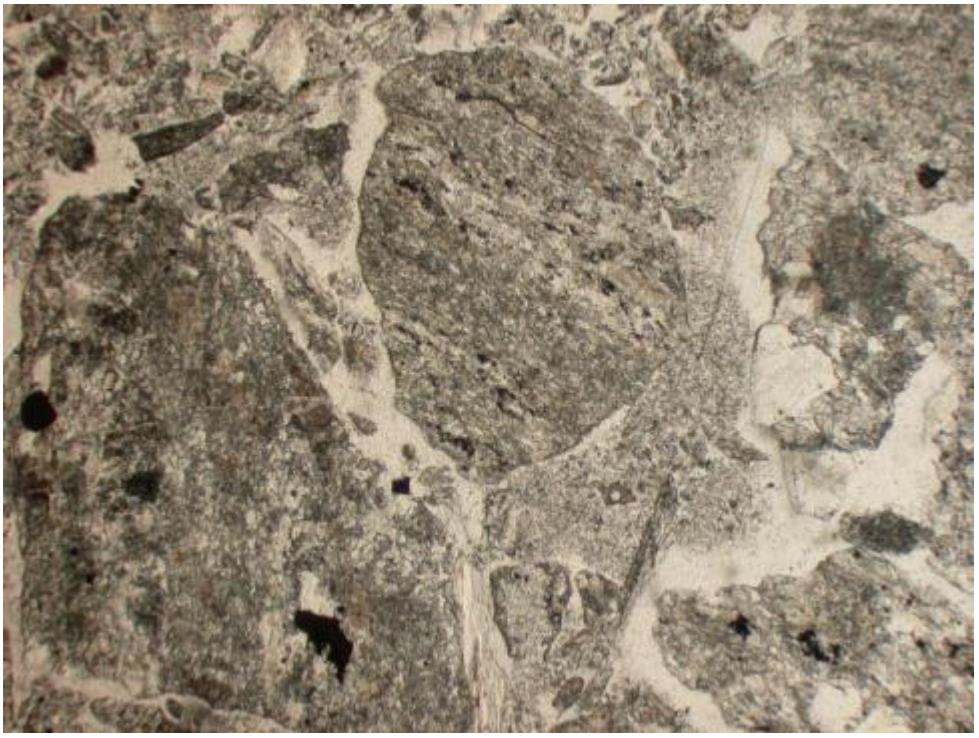
Carbonate occurs in major amounts (~50%) as colourless to cloudy brownish carbonate in the following forms: 1) fine to very fine-grained (< 0.6 mm), anhedral aggregates as replacement of rock fragments, 2) fine to very fine-grained (< 1 mm) anhedral aggregates within quartz±carbonate vein fragments, and 3) as fine-grained liberated grains (< 0.7 mm). Note some of the carbonate is strained with local development of undulatory extinction and subgrains.

Sulphide occurs in minor amounts (~3%) as pyrite and rarely as chalcopyrite. Pyrite grains are fine to medium-grained (< 0.4 mm), subhedral and occur disseminated and as clusters and in altered rock fragments and as fine to medium-grained (< 3 mm) liberated anhedral grains and aggregate. Pyrite grains have irregular to straight grain boundaries which are unaltered. Rare fine to very fine-grained (< 0.1 mm) chalcopyrite occur disseminated in rock fragments and as inclusions in pyrite.

Tabular summary (visual estimate):

Sample # -	**Sulphide**	**% ~**	**Carbonate occurrence**	**% ~**	**Fe-Ox**	**% ~**	**Other**	**% ~**
HC-32	pyrite	3	colourless and cloudy	50		x	quartz	20
	chalcopyrite	tr	brownish, fine to				chlorite	15
			very fine-grained				sericite	7
							tourmaline	3
							rutile	1

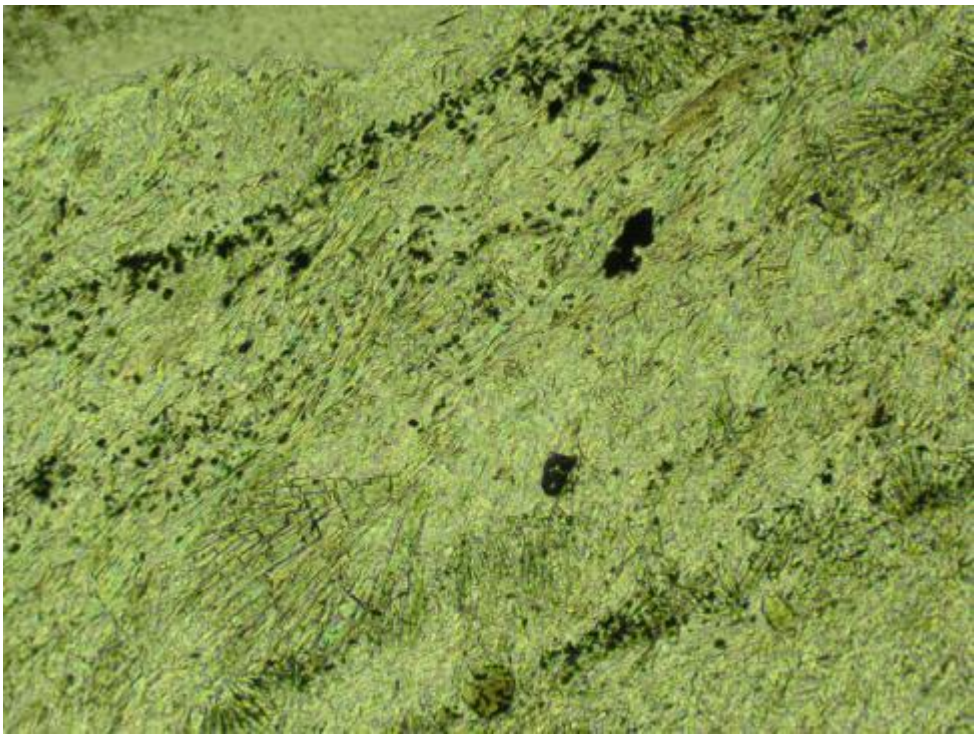
Abbreviations: tr = trace (< 1%); r. = rare; x = none observed
-fine-grained = > 0.05 mm and < 1 mm; very fine-grained = < 0.05 mm; medium-grained = 1-5 mm
-Fe-ox = iron and/or Fe-Ti-oxides, includes amorphous, very fine-grained poorly crystalline and/or crystalline ferric hydroxides, oxides, oxyhydroxides, hydroxy-sulphate and/or oxyhydroxy-sulphate minerals



A

B

HC-32: A&B) View of banded quartz-chlorite-rutile-sericite-carbonate aggregate with disseminated opaques (pyrite) and quartz-carbonate vein fragment (right). A) PPL, B) XPL, FOV =~ 4.5 mm.



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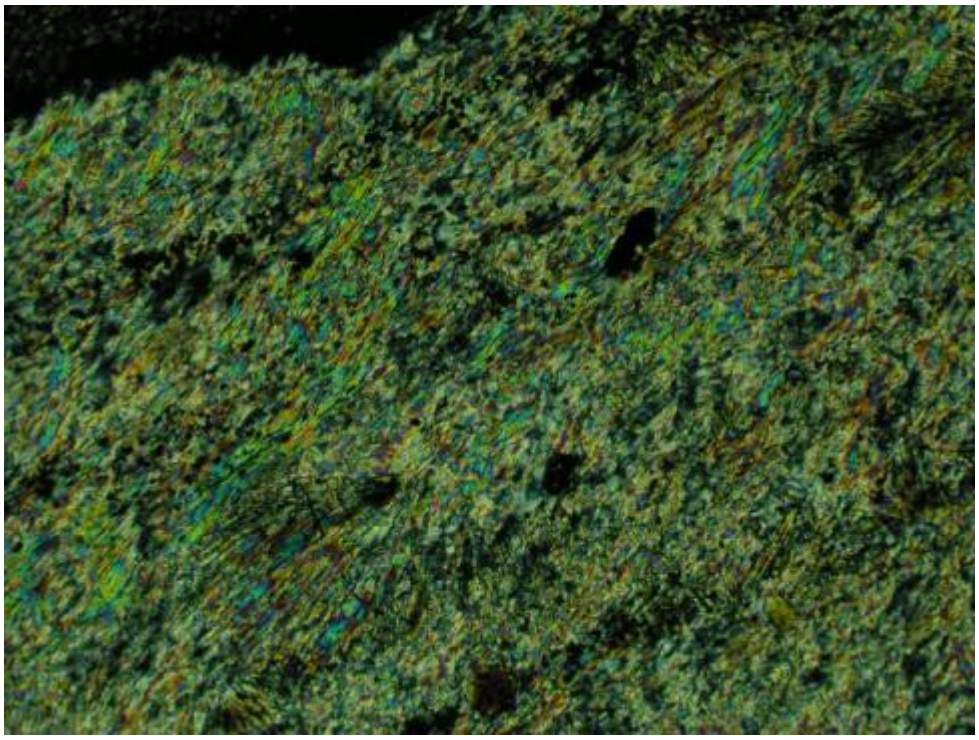
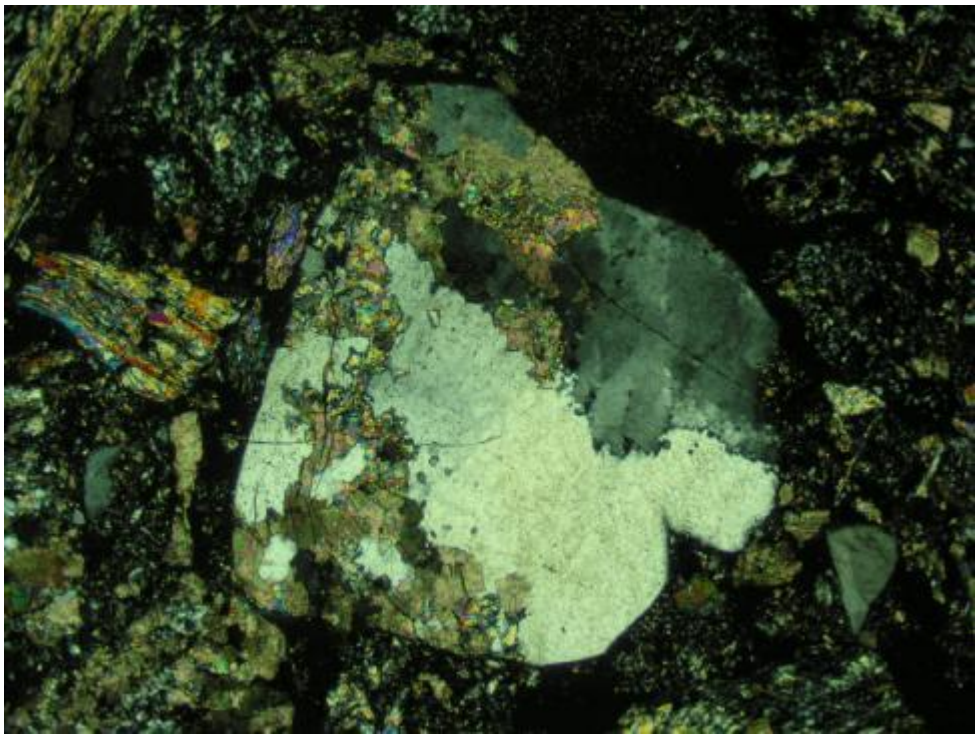
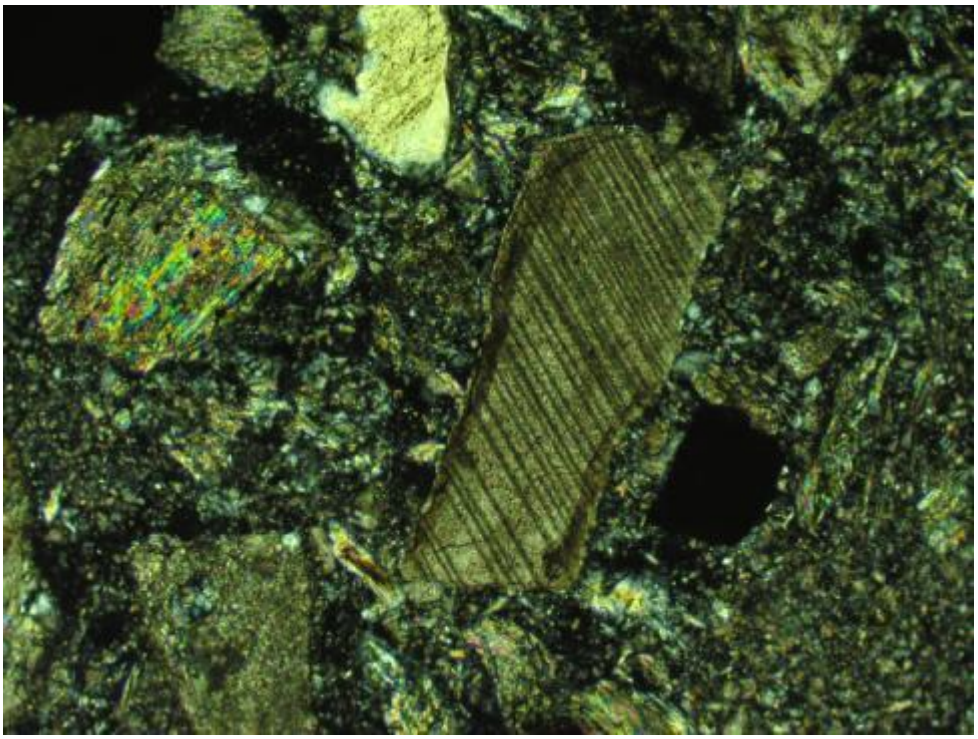


D

HC-32: C&D) Detailed view of sericite aggregate with radiating fine tourmaline, very fine bands of rutile and disseminated pyrite. FOV =~ 4.5 mm, C) PPL, D) XPL.

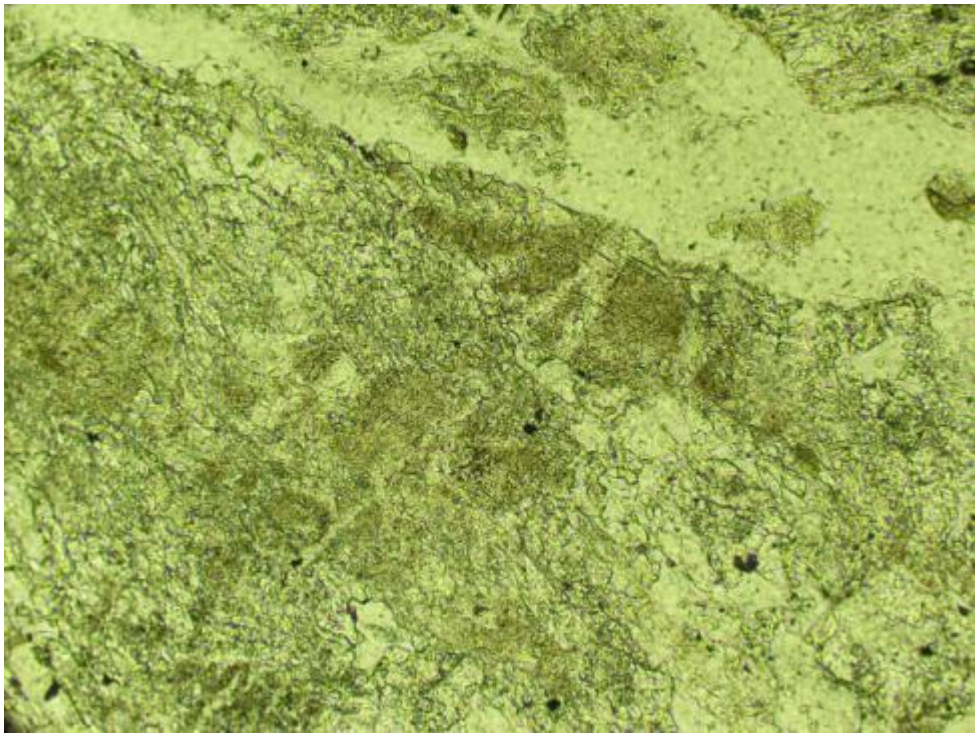


E

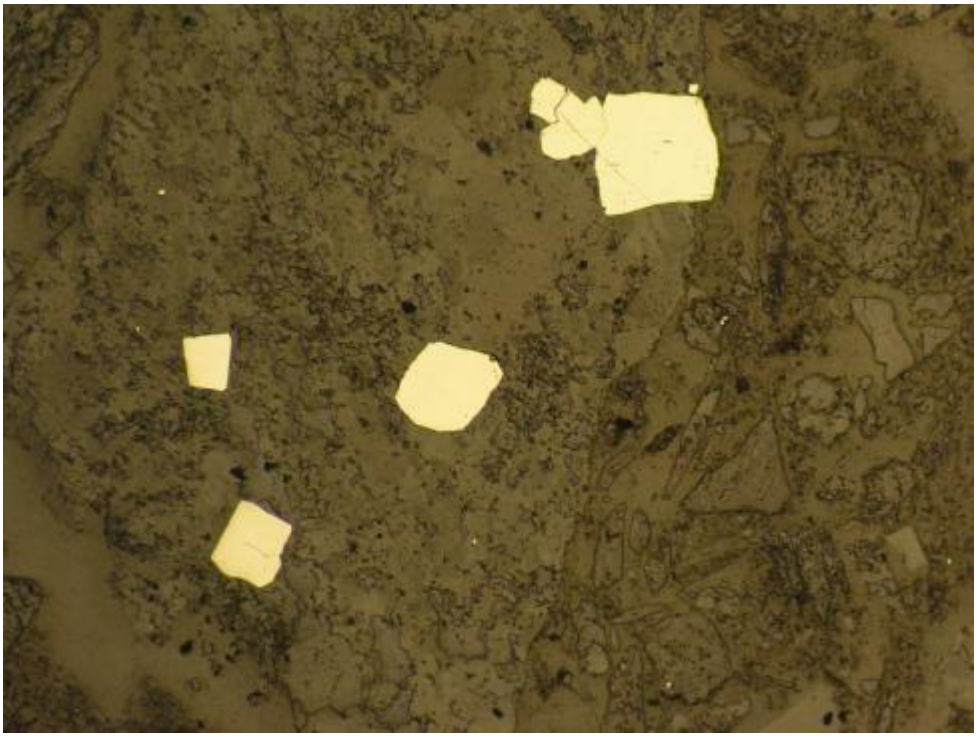


F

HC-32: E) Quartz-carbonate vein fragment (centre) and liberated tourmaline aggregate (left). XPL, FOV =~ 2.6 mm.
F) Liberated cloudy carbonate grain (centre). XPL, FOV =~ 1.3 mm.

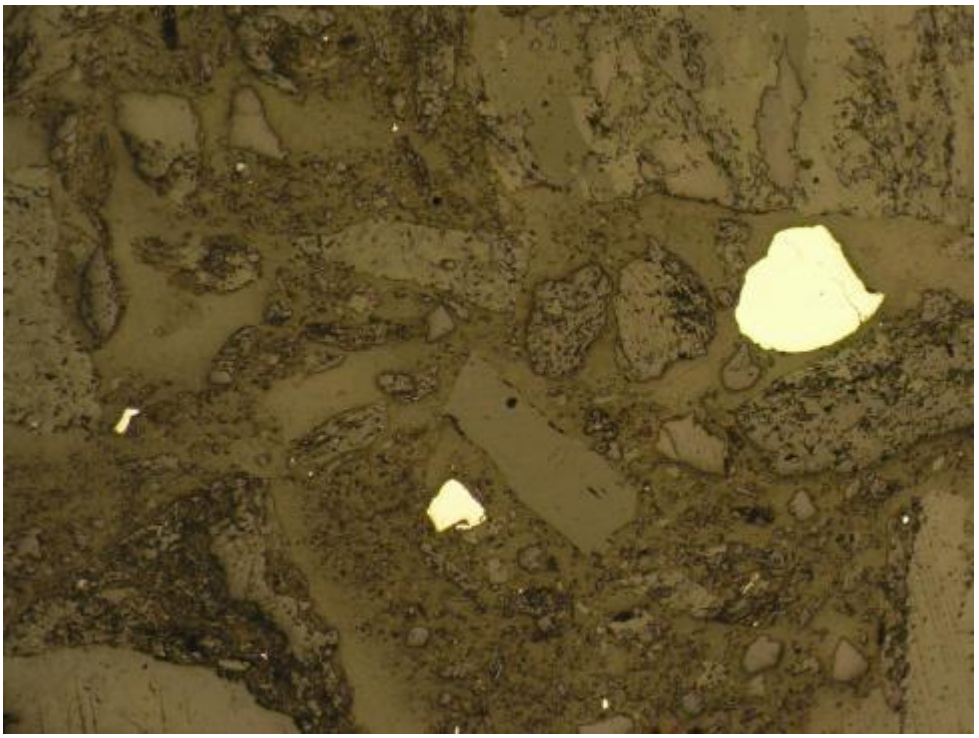


G



H

HC-32: G) Very fine-grained colourless to cloudy brownish carbonate aggregate. PPL, FOV =~ 1.3 mm. H) Disseminated pyrite in quartz-carbonate aggregate. RL, FOV =~ 2.6 mm.



I

HC-32: I) Liberated pyrite grains. RL, FOV =~ 2.6 mm.

Project: Hope Bay **Deposit:** Boston **Zone:** Boston
Rock Type: Sedimentary units: Wacke
Sample ID: HC-35 **Offcut #**: AP-5

Crushed Rock and Offcut Mount Description:
Fine to coarse angular chips (less than 8 mm size). Chips comprise fine-grained greenish-grey and medium to dark grey foliated rock and white vein fragments. No reaction of chips to cold dilute HCl. No reaction of chips to magnet. No reaction of chips to etching with HF and staining with sodium cobaltinitrite (no yellow stain).

Polished Thin Section Description:
Fine to coarse chips representing variably altered and variably deformed rock: 1) foliated rock comprising very fine-grained plagioclase-quartz-chlorite-rutile±sericite aggregate with patchy fine to very fine carbonate aggregate and scattered porphyroclasts of fine-grained anhedral quartz and less commonly plagioclase, 2) fine to very fine-grained quartz aggregate as vein fragments, 3) fine to medium-grained carbonate±quartz aggregate as vein fragments and 4) fine-grained carbonate aggregate as vein fragments. Quartz, carbonate, plagioclase and trace pyrite occur as liberated grains. Chlorite comprises ~ 7% of the section as very fine-grained patchy aggregates within foliated rock fragments. Rutile occurs in minor amounts, ~2%, as very fine-grained aggregates in bands, as fine disseminated grains and as patchy aggregates. Quartz, ~ 20%, occurs as very fine-grained anhedral aggregates with plagioclase in foliated rock fragments, as fine-grained porphyroclasts and as fine to very fine anhedral aggregates (< 0.5 mm), commonly with undulose extinction and development of subgrains, in vein fragments. Plagioclase, ~ 20%, occurs as very fine-grained anhedral aggregates with quartz in foliated rock fragments and as fine-grained porphyroclasts. Sericite, ~25%, occurs as very fine-grained anhedral aggregates developed along foliation planes forming a banded texture. Traces of very fine-grained zircon occur rarely disseminated in the foliated rock fragments.

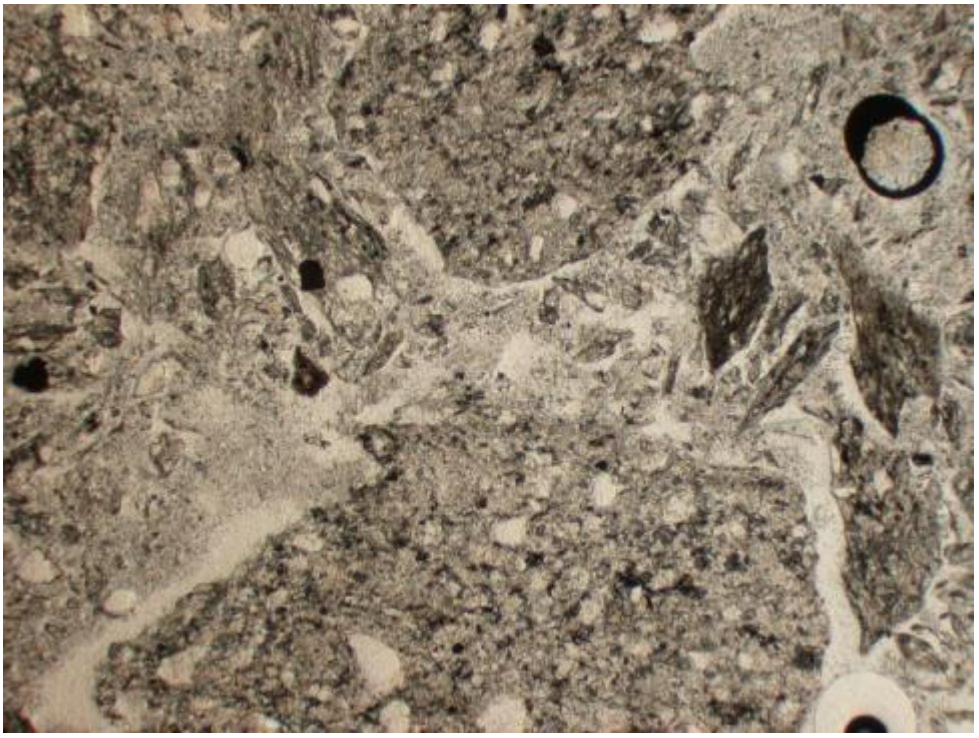
Carbonate occurs in major amounts (~25%) as colourless to cloudy brownish carbonate in the following forms: 1) fine to very fine-grained (< 0.15 mm), anhedral patchy aggregates as replacement of foliated rock fragments, 2) fine to medium-grained (< 1.5 mm) anhedral aggregates within carbonate±quartz vein fragments, and 3) as fine to medium-grained liberated grains (< 2 mm).

Sulphide occurs in minor amounts (~1%) as pyrite and rarely as chalcopyrite. Pyrite grains are fine to very fine-grained (< 0.1 mm), sub-anhedral and occur disseminated and as clusters and in altered rock fragments and as fine-grained (< 0.6 mm) liberated anhedral grains. Pyrite grains have irregular to straight grain boundaries which are unaltered. Rare fine to very fine-grained (< 0.1 mm) chalcopyrite occur disseminated and clusters in rock fragments.

Tabular summary (visual estimate):

Sample # -	**Sulphide**	**% ~**	**Carbonate occurrence**	**% ~**	**Fe-Ox**	**% ~**	**Other**	**% ~**
HC-35	pyrite	1	cloudy and colourless	25		x	sericite	25
	chalcopyrite	r.	brownish, very fine to				quartz	20
			medium-grained				plagioclase	20
							chlorite	7
							rutile	2
							zircon	r.

Abbreviations: tr = trace (< 1%); r. = rare; x = none observed
-fine-grained = > 0.05 mm and < 1 mm; very fine-grained = < 0.05 mm; medium-grained = 1-5 mm
-Fe-ox = iron and/or Fe-Ti-oxides, includes amorphous, very fine-grained poorly crystalline and/or crystalline ferric hydroxides, oxides, oxyhydroxides, hydroxy-sulphate and/or oxyhydroxy-sulphate minerals



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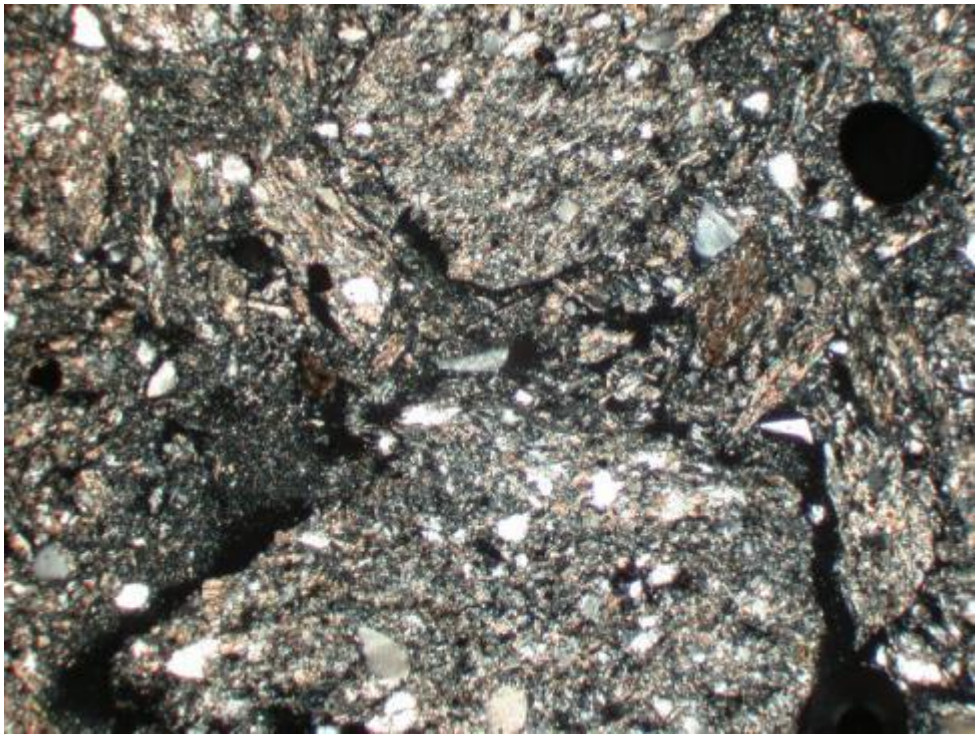
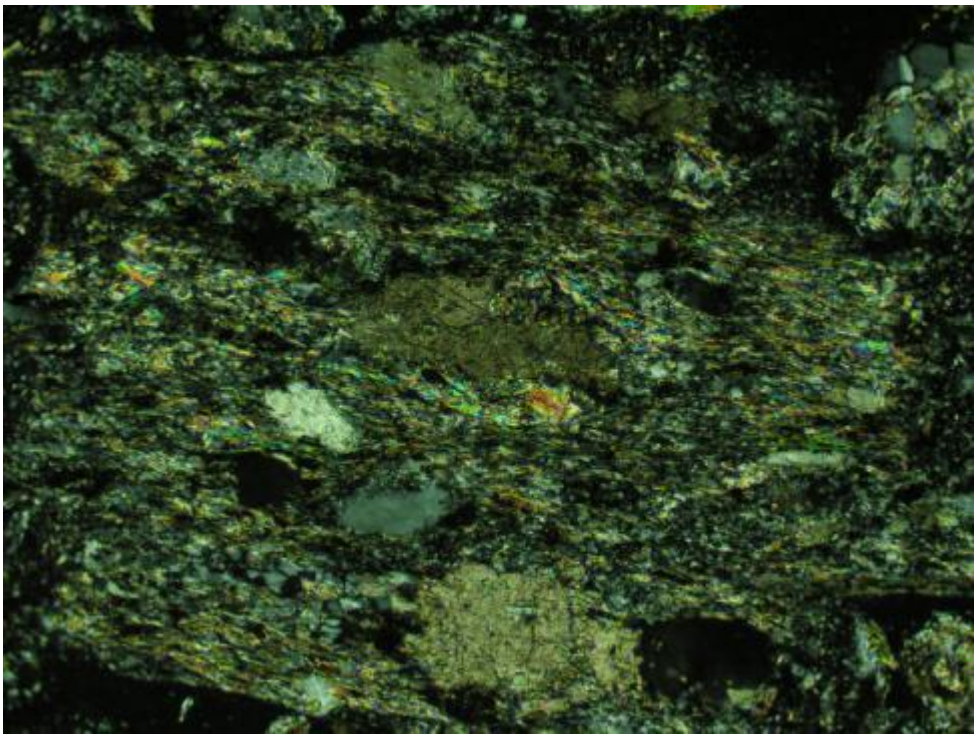


B

HC-35: A&B) View of foliated foliated rock with scattered porphyroclasts of fine-grained anhedral quartz and plagioclase. A) PPL, B) XPL, FOV =~ 4.5 mm.



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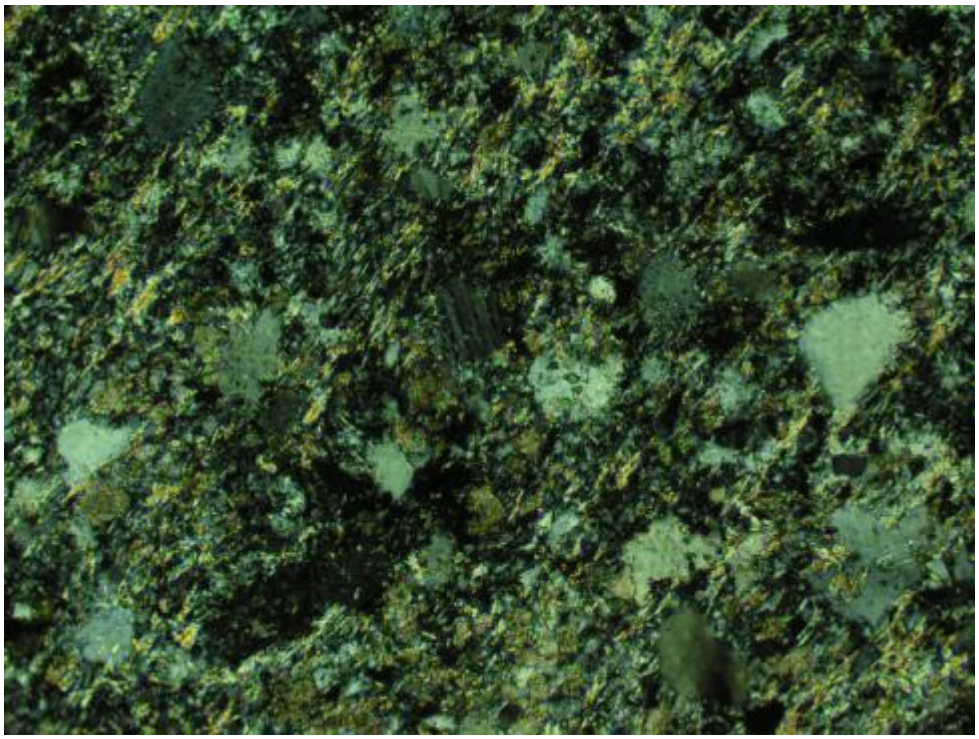
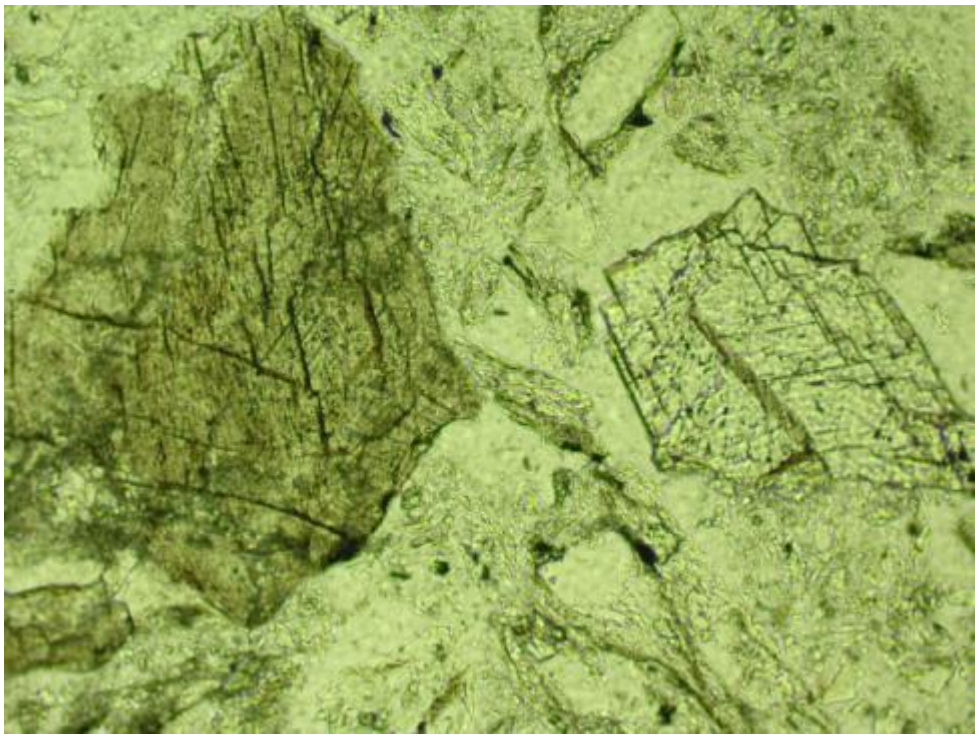
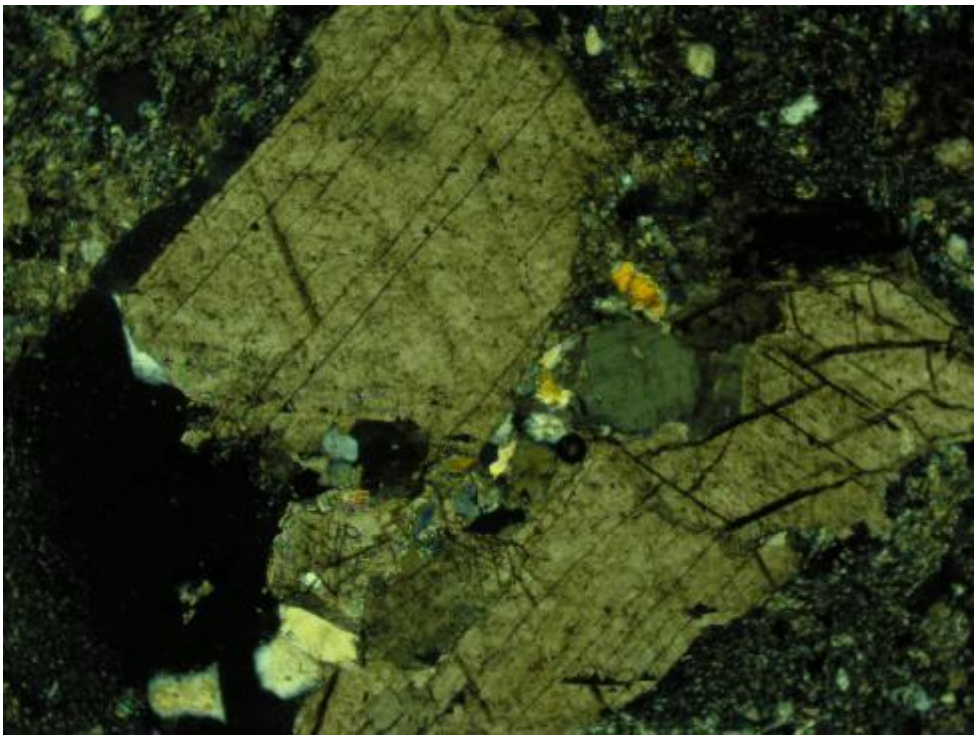


D

HC-35: C&D) Detailed separate views of foliated rock comprising very fine-grained plagioclase-quartz-chlorite-rutile±sericite aggregate with patchy fine to very fine carbonate aggregate and scattered porphyroclasts of fine-grained anhedral quartz and less commonly plagioclase. FOV =~ 1.3 mm, XPL.

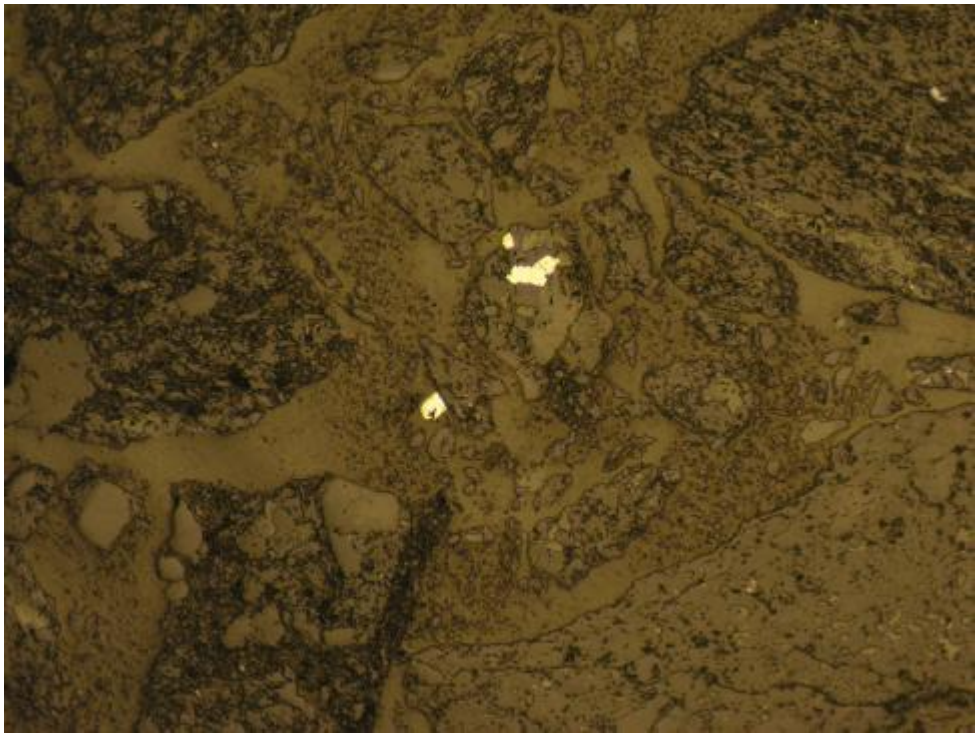


E

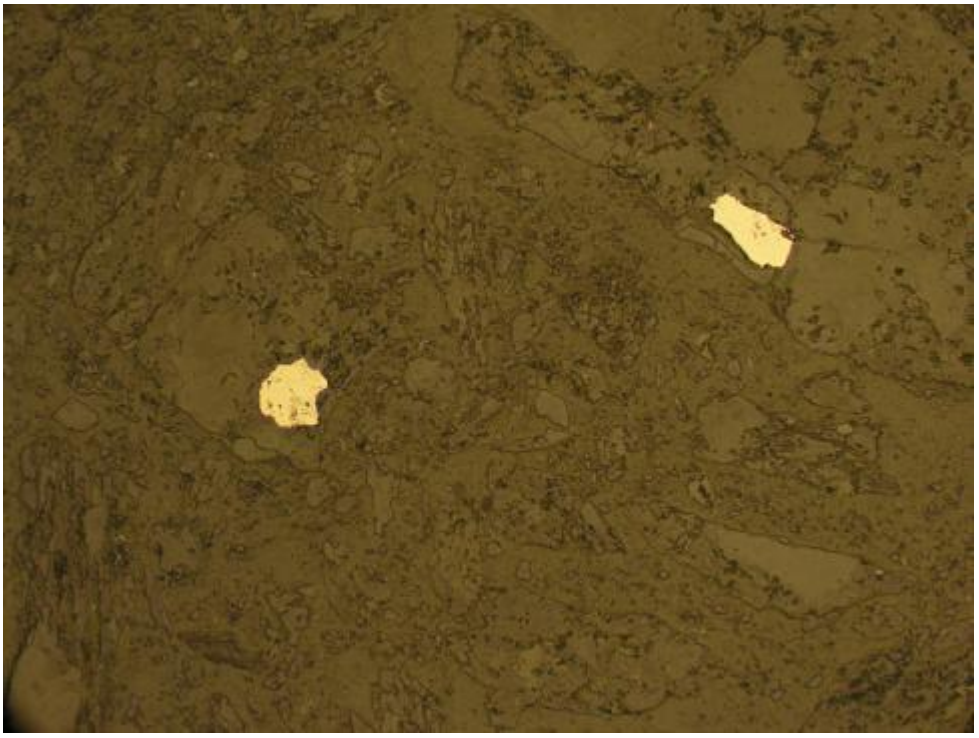


F

HC-35: E) Cloudy brownish carbonate aggregate (left) and colourless liberated carbonate grain (right). PPL, FOV =~ 1.3 mm. F) Carbonate-quartz vein fragment. XPL, FOV =~ 2.6 mm.



G



H

HC-35: G) Distribution of pyrite in section. RL, FOV =~ 2.6 mm. H) Detailed view of anhedral disseminated pyrite. RL, FOV =~ 1.3 mm.

Project: Hope Bay **Deposit:** Doris **Zone:**
Rock Type: Mafic volcanic: Flow basalt
Sample ID: HC-50 **Offcut #**: AP-6

Crushed Rock and Offcut Mount Description:
Fine to coarse angular chips (less than 20 mm size). Chips comprise mostly light olive-grey strongly foliated rock and white quartz vein fragments. Trace to major amounts of fine-grained pyrite occur disseminated, in bands or in fractures. No reaction of chips to cold dilute HCl. No reaction of chips to magnet. No reaction of rock chips to etching with HF and staining with sodium cobaltinitrite (no yellow stain).

Polished Thin Section Description:
Fine to coarse chips representing altered and variably deformed rock: 1) fine to very fine-grained, strongly foliated quartz-sericite-carbonate-rutile aggregate with sericite and rutile defining the orientation of the foliation, 2) fine to very fine-grained massive quartz-carbonate aggregate locally with minor sericite and 3) very fine to medium-grained quartz, carbonate and carbonate-quartz vein fragments (approx. 25% of section). Carbonate, quartz and pyrite occur commonly as liberated grains. Sericite, ~ 20%, occurs as fine to very fine-grained (< 0.35 mm) flaky aggregates. Quartz, approximately 40%, occurs as fine to very fine-grained (< 0.1 mm) anhedral aggregates within massive quartz-carbonate aggregate and as fine to medium-grained aggregates (< 2 mm) in vein fragments. Vein quartz commonly has undulose extinction and development of subgrains. Traces of quartz and sericite occur as fine to very fine-grained pressure fringes to pyrite porphyroblasts. Minor rutile, ~ 4%, occurs as very fine-grained aggregates within the foliation of rock fragments, as clusters and disseminated. Rarely, chlorite occurs with quartz and carbonate as very fine aggregates in veinlets cutting foliated rock fragments.

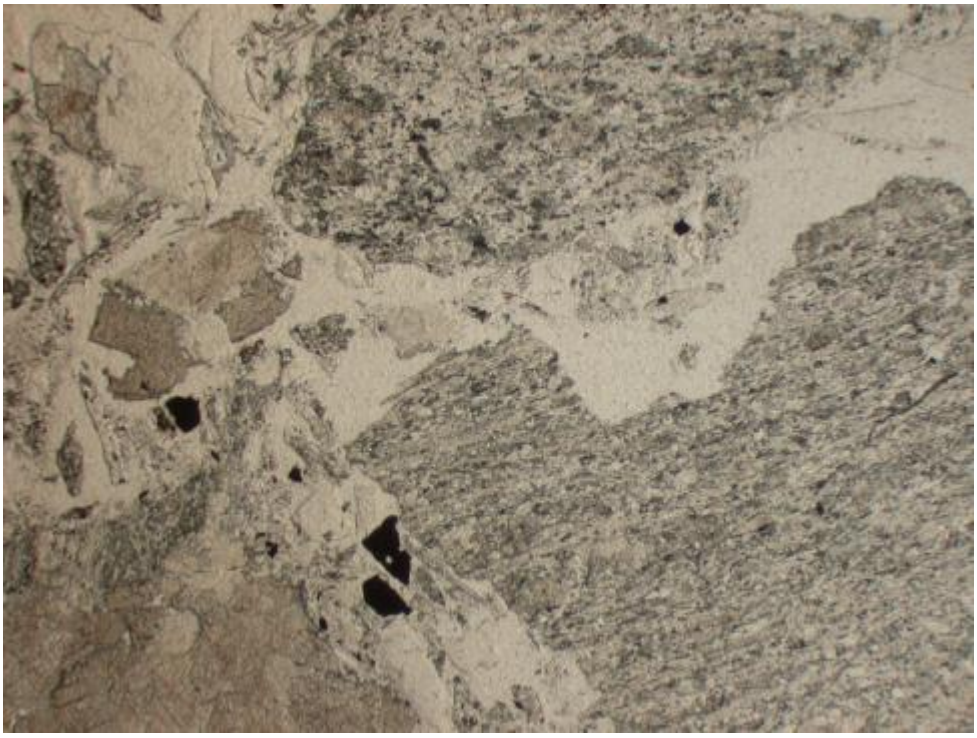
Carbonate occurs in major amounts (~30%) as colourless to cloudy brownish carbonate in the following forms: 1) fine to very fine-grained (< 0.2 mm), anhedral to rhombic colourless to cloudy aggregates within foliated quartz-sericite-carbonate-rutile fragments, 2) fine to very fine-grained (< 0.2 mm), anhedral aggregates within massive quartz-carbonate±sericite fragments, 3) fine to medium-grained cloudy brownish aggregate (< 2 mm) in vein fragments and 4) as fine to medium-grained cloudy brownish liberated grains (< 2 mm). Approximately half the carbonate, particularly the vein carbonate is cloudy and brownish. Note some of the vein carbonate is strained with local development of undulatory extinction and subgrains. Rarely, very fine-grained red-brown Fe-ox occur partly replacing cloudy carbonate.

Sulphide occurs in major amounts (overall ~5%) as pyrite with rare chalcopyrite. Pyrite grains are fine to very fine grained (< 1 mm) and occur as disseminated to patchy sub-anhedral grains and aggregate in altered rock fragments and as liberated anhedral grains. The amount of pyrite in rock chips varies from absent to abundant. Pyrite grains have irregular to straight grain boundaries which are unaltered. Chalcopyrite occurs rarely as very fine inclusions in pyrite.

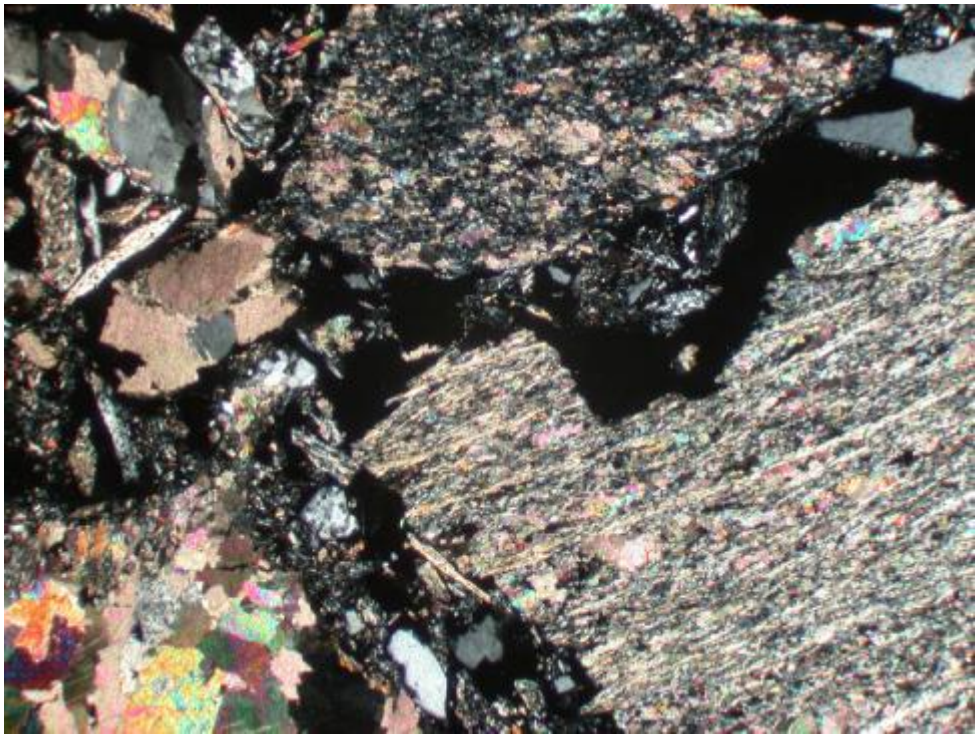
Tabular summary (visual estimate):

Sample # -	**Sulphide**	**% ~**	**Carbonate occurrence**	**% ~**	**Fe-Ox**	**% ~**	**Other**	**% ~**
HC-50	pyrite	5	colourless to cloudy	30	red-brown	r.	quartz	40
	chalcopyrite	r.	brownish,very fine to		unknown		sericite	20
			medium-grained				rutile	4
							chlorite	r.

Abbreviations: tr = trace (< 1%); r. = rare; x = none observed
-fine-grained = > 0.05 mm and < 1 mm; very fine-grained = < 0.05 mm; medium-grained = 1-5 mm
-Fe-ox = iron and/or Fe-Ti-oxides, includes amorphous, very fine-grained poorly crystalline and/or crystalline ferric hydroxides, oxides, oxyhydroxides, hydroxy-sulphate and/or oxyhydroxy-sulphate minerals



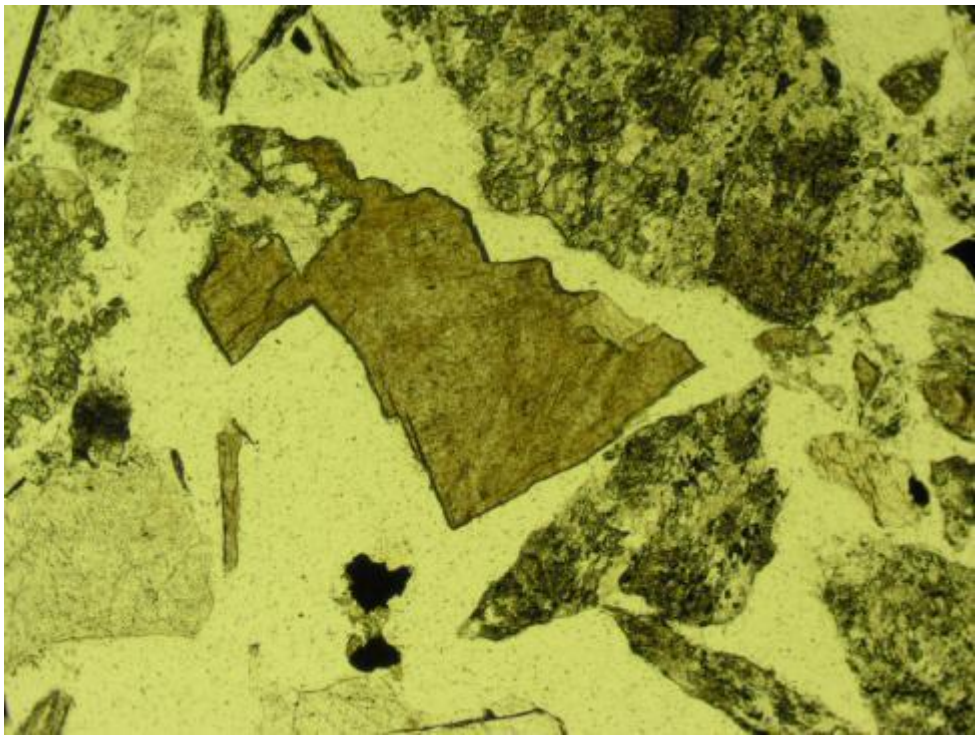
A



B

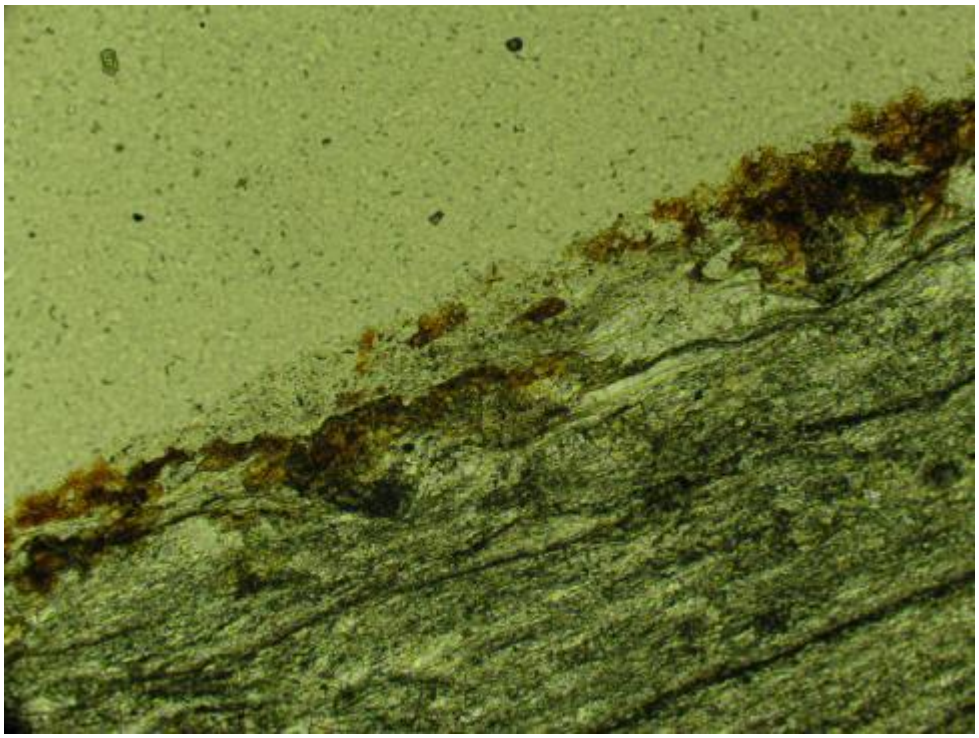
HC-50: A&B) View of altered and deformed rock rock chips including strongly foliated quartz-sericite-carbonate-rutile aggregate (right), massive quartz-carbonate±sericite aggregate (top) and carbonate and quartz-carbonate vein fragments (left). A) PPL, B) XPL, FOV =~ 4.5 mm.

C



D

HC-50: C) Detailed view strongly foliated quartz-sericite-carbonate-rutile aggregate. Note patchy colourless to cloudy carbonate. FOV =~ 1.3 mm, PPL, D) View of cloudy brownish carbonate vein fragment (centre). FOV =~ 2.6 mm, PPL.



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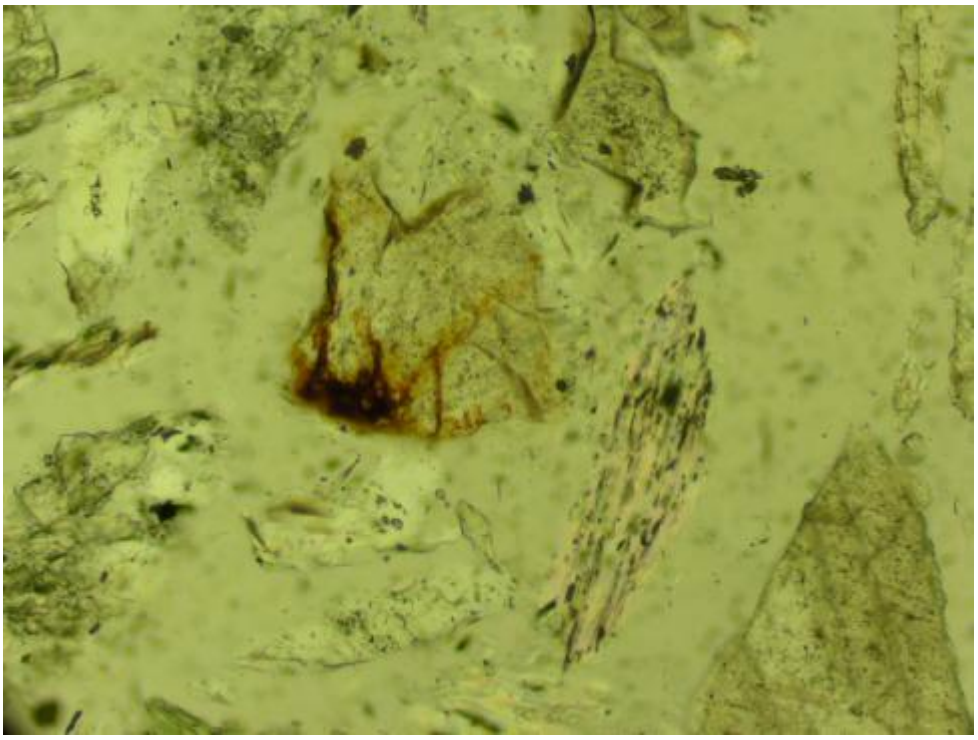
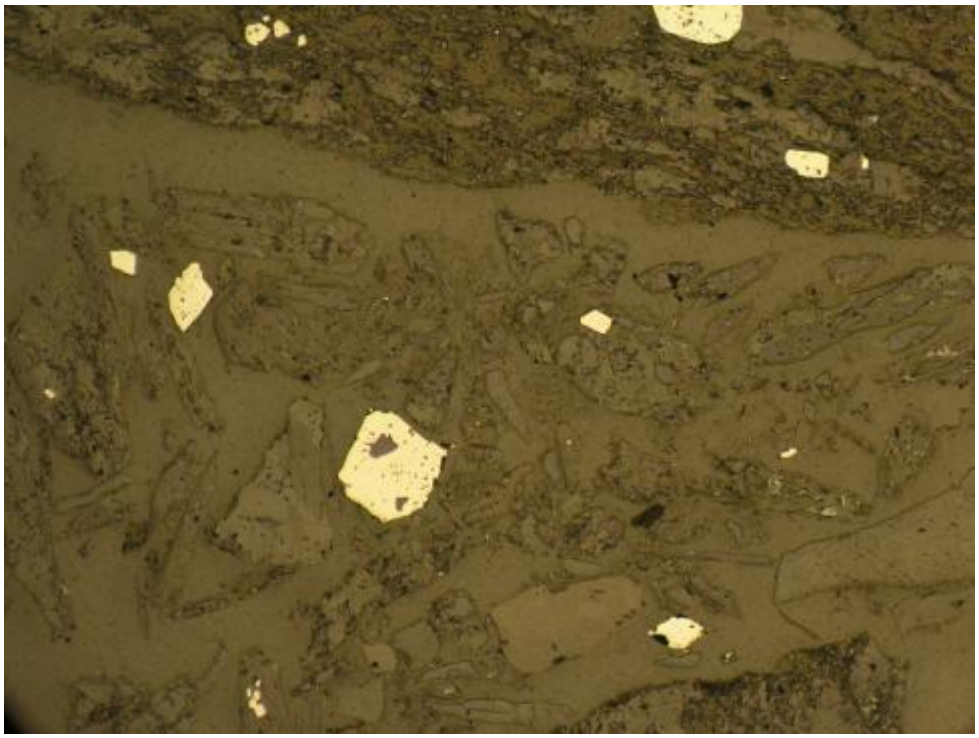
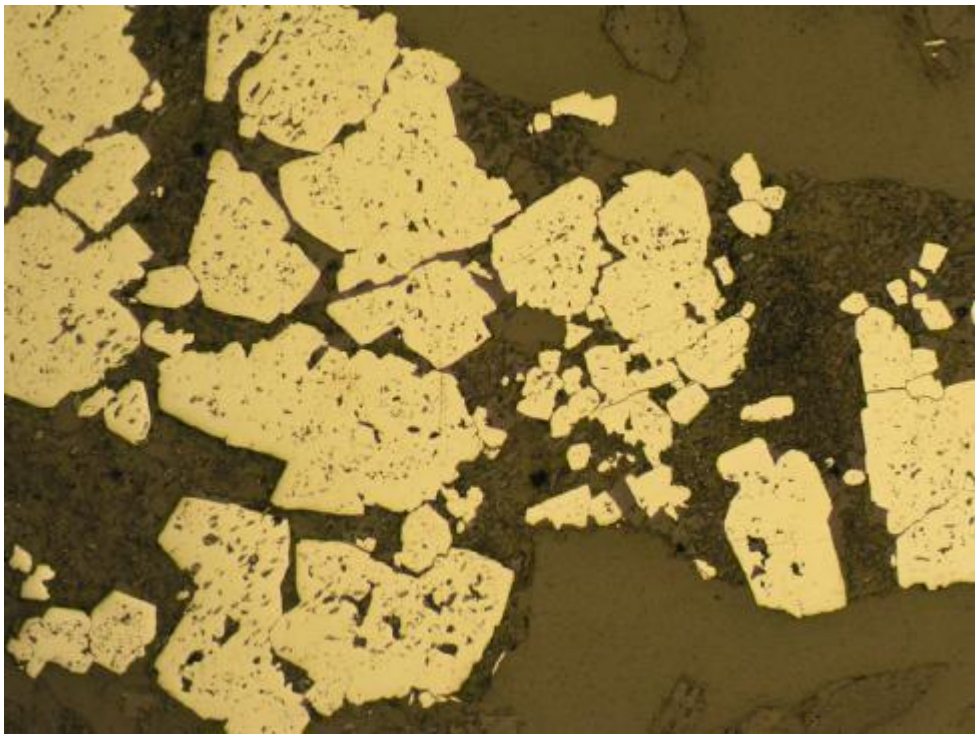


F

HC-50: E) Fine-grained anhedral carbonate aggregate partly replaced by red-brown Fe-ox at edge of foliated quartz-sericite-carbonate-rutile aggregate. PPL, FOV =~ 1.3 mm. F) Liberated cloudy carbonate partly replaced by red-brown Fe-ox aggregate. PPL, FOV =~ 0.7 mm.



G



H

HC-50: G) Liberated pyrite grains and disseminated pyrite within foliated rock fragment. RL, FOV =~ 2.6 mm. H) Abundant fine-grained sub-anhedral pyrite aggregate within rock fragment. RL, FOV =~ 2.6 mm.

Project: Hope Bay **Deposit:** Doris **Zone:**
Rock Type: Late gabbro
Sample ID: HC-51 **Offcut #**: AP-7

Crushed Rock and Offcut Mount Description:
Fine to coarse angular chips (less than 20 mm size). Chips comprise mostly dark greenish-grey granular rock and foliated greenish-brown fragments. Minor fine-grained pyrite occur disseminated. No reaction of chips to cold dilute HCl. No reaction of chips to magnet. No reaction of rock chips to etching with HF and staining with sodium cobaltinitrite (no yellow stain).

Polished Thin Section Description:
Fine to coarse chips representing altered and variably deformed rock: 1) fine to very fine-grained, weakly foliated carbonate-chlorite-rutile±quartz±sericite aggregate with chlorite and rutile defining the orientation of the foliation, 2) fine to very fine-grained massive to weakly foliated quartz-sericite-carbonate-rutile aggregate, 3) fine to medium-grained quartz-carbonate vein fragments and 4) very fine to fine-grained carbonate and carbonate± chlorite veinlets (0.2 mm to > 2 mm). Sericite, ~ 20%, occurs as fine to very fine-grained (< 0.1 mm) flaky aggregates. Quartz, approximately 13%, occurs as fine to very fine-grained (< 0.1 mm) anhedral aggregates within foliated and massive rock fragments and as fine to medium-grained aggregates (< 3 mm) in vein fragments. Vein quartz commonly has undulose extinction. Minor rutile, ~ 6%, occurs as very fine-grained aggregates forming discontinuous bands in rock fragments, as clusters and disseminated. Chlorite, ~10%, occurs as very fine-grained aggregates in weakly foliated carbonate-chlorite-rutile±quartz±sericite aggregate. Rarely, chlorite occurs with carbonate as very fine aggregates in veinlets cutting foliated rock fragments. Rare traces of very fine-grained red-brown Fe-ox occur in late fractures.

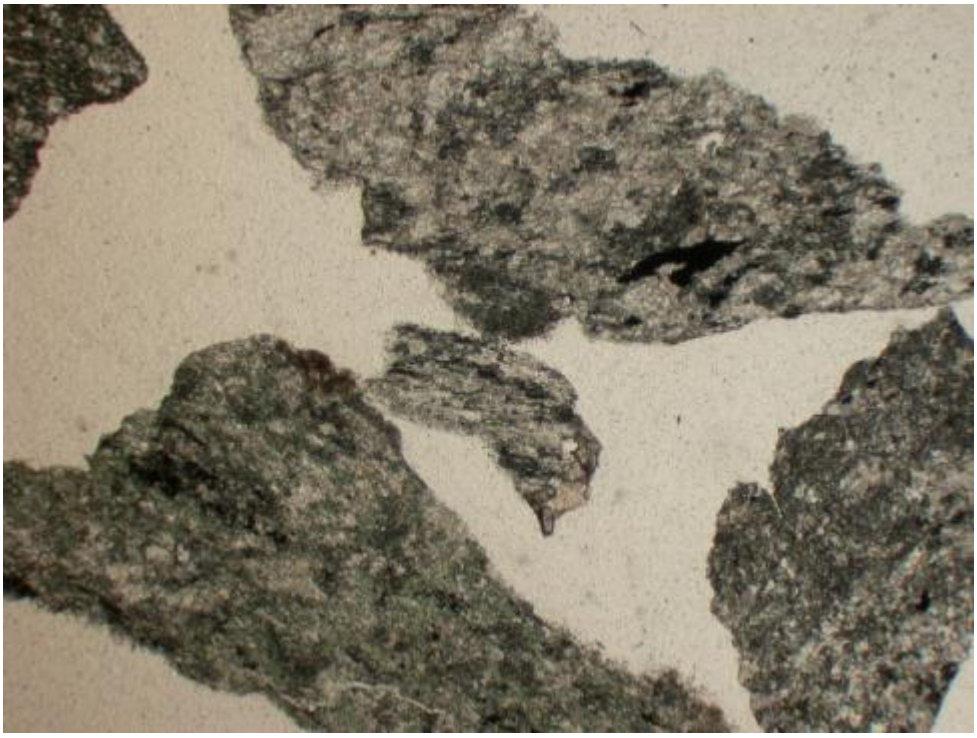
Carbonate occurs in major amounts (~50%) as colourless to cloudy brownish carbonate in the following forms: 1) fine to very fine-grained (typically < 0.15 mm, up to 0.35 mm), anhedral to rhombic colourless to cloudy aggregates within massive to foliated rock fragments and 2) fine to medium-grained cloudy brownish aggregate (< 2 mm) in vein fragments. Much of the carbonate, particularly the vein carbonate is cloudy and brownish. Note some of the vein carbonate is strained with local development of undulatory extinction and subgrains.

Sulphide occurs in trace amounts as pyrite with rare chalcopyrite. Pyrite grains are fine to very fine grained (< 0.5 mm) and occur disseminated in some altered rock fragments. Pyrite grains have irregular to straight grain boundaries which are unaltered. Chalcopyrite occurs rarely disseminated as very fine anhedral grains.

Tabular summary (visual estimate):

Sample # -	**Sulphide**	**% ~**	**Carbonate occurrence**	**% ~**	**Fe-Ox**	**% ~**	**Other**	**% ~**
HC-51	pyrite	tr	colourless to cloudy	50	red-brown	r.	sericite	20
	chalcopyrite	r.	brownish,very fine to		unknown		quartz	13
			medium-grained				chlorite	10
							rutile	6

Abbreviations: tr = trace (< 1%); r. = rare; x = none observed
-fine-grained = > 0.05 mm and < 1 mm; very fine-grained = < 0.05 mm; medium-grained = 1-5 mm
-Fe-ox = iron and/or Fe-Ti-oxides, includes amorphous, very fine-grained poorly crystalline and/or crystalline ferric hydroxides, oxides, oxyhydroxides, hydroxy-sulphate and/or oxyhydroxy-sulphate minerals



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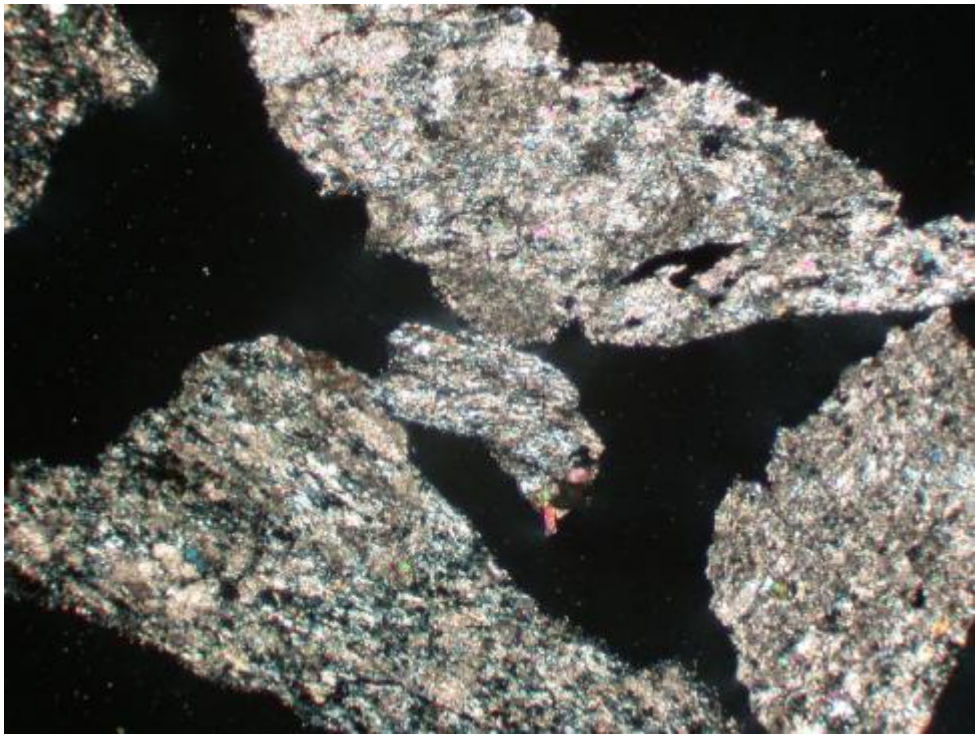
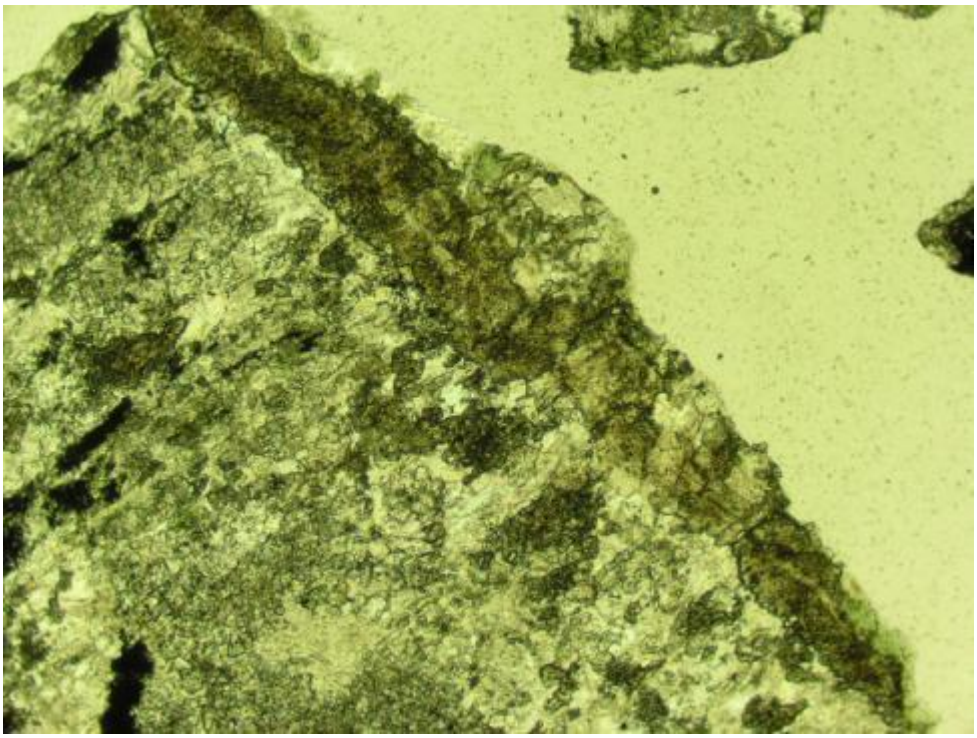


B

HC-51: A&B) View of altered and deformed rock rock chips including weakly foliated carbonate-chlorite-rutile±quartz±sericite aggregate (lower left) and massive to weakly foliated quartz-sericite-carbonate-rutile aggregate (top and right). A) PPL, B) XPL, FOV =~ 4.5 mm.



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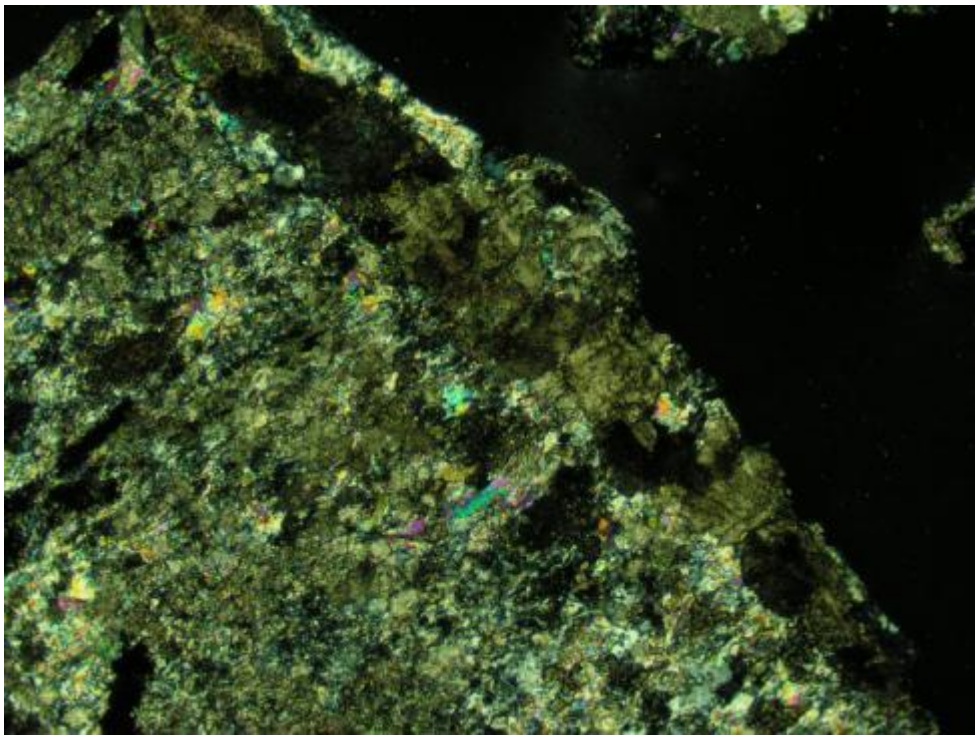
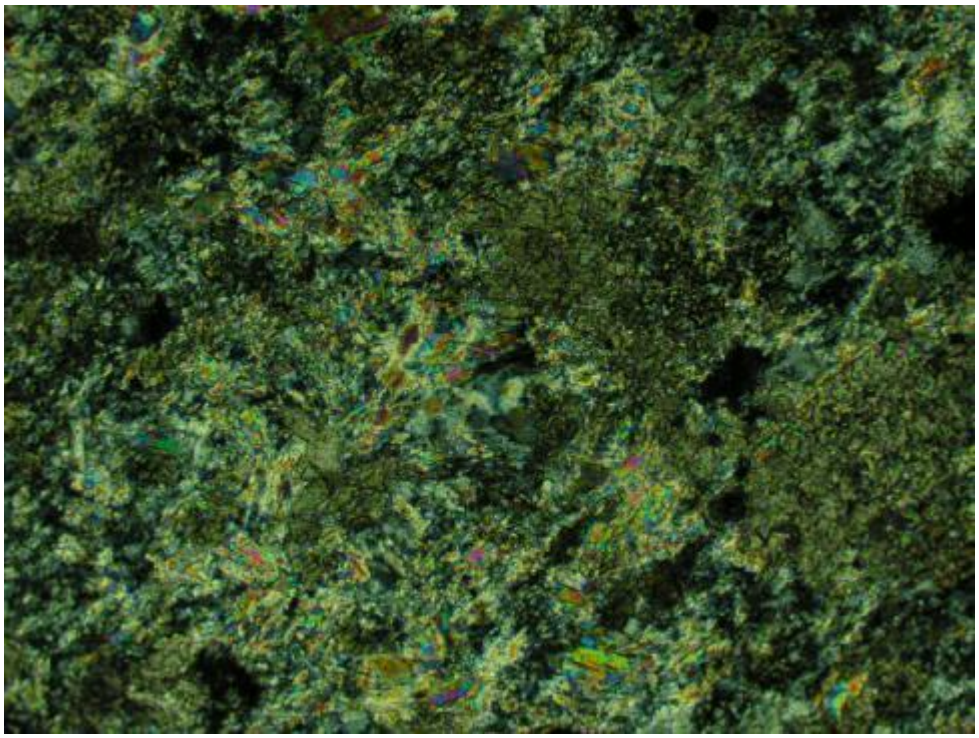


D

HC-51: C&D) Detailed view of massive carbonate-sericite-quartz-rutile aggregate cut by cloudy brownish carbonate-chlorite veinlet. Note carbonate in rock fragment varies from colourless to cloudy brownish. FOV =~ 2.6 mm, C) PPL, E) XPL.



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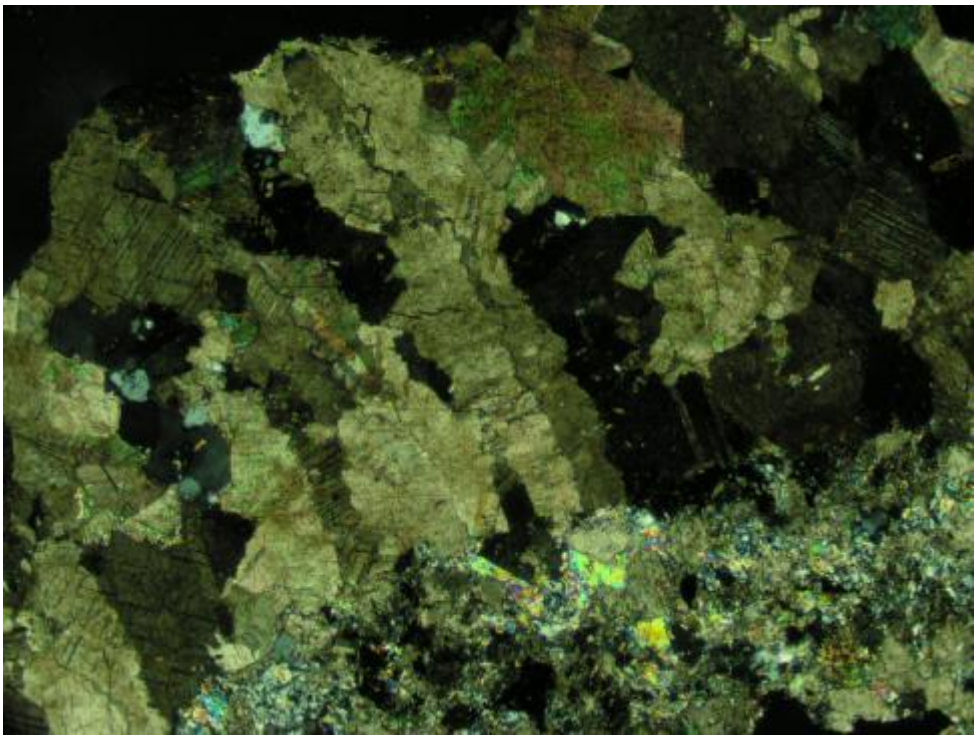
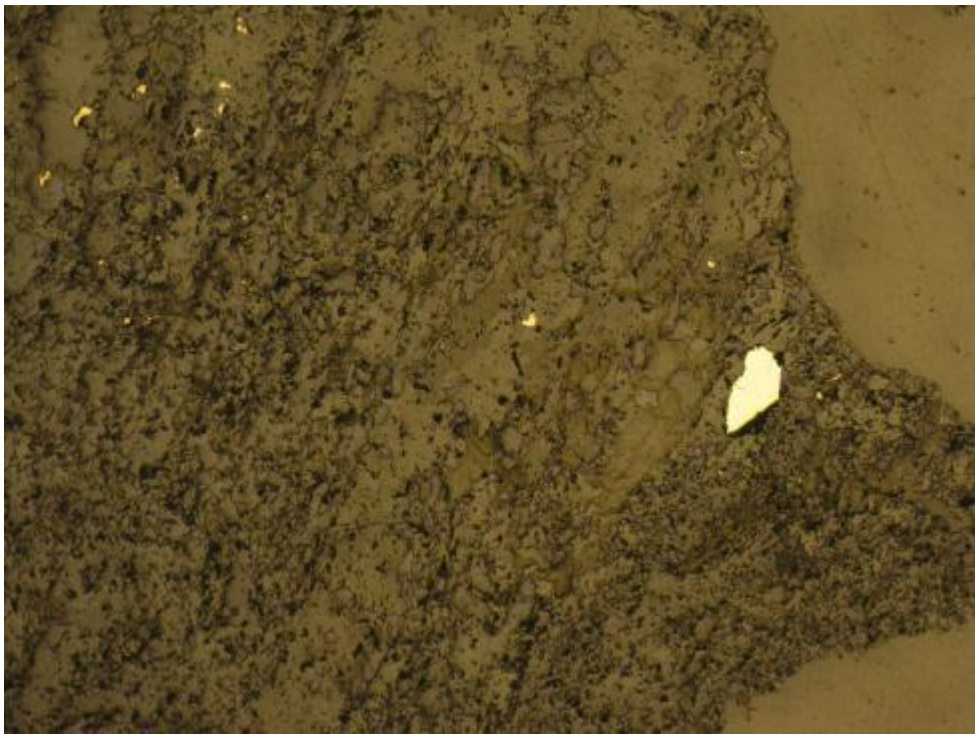


F

HC-51: E) Detailed view of massive carbonate-sericite-quartz-rutile aggregate. XPL, FOV =~ 1.3 mm. F) Cloudy brown carbonate-quartz veinlet. XPL, FOV =~ 2.6 mm.



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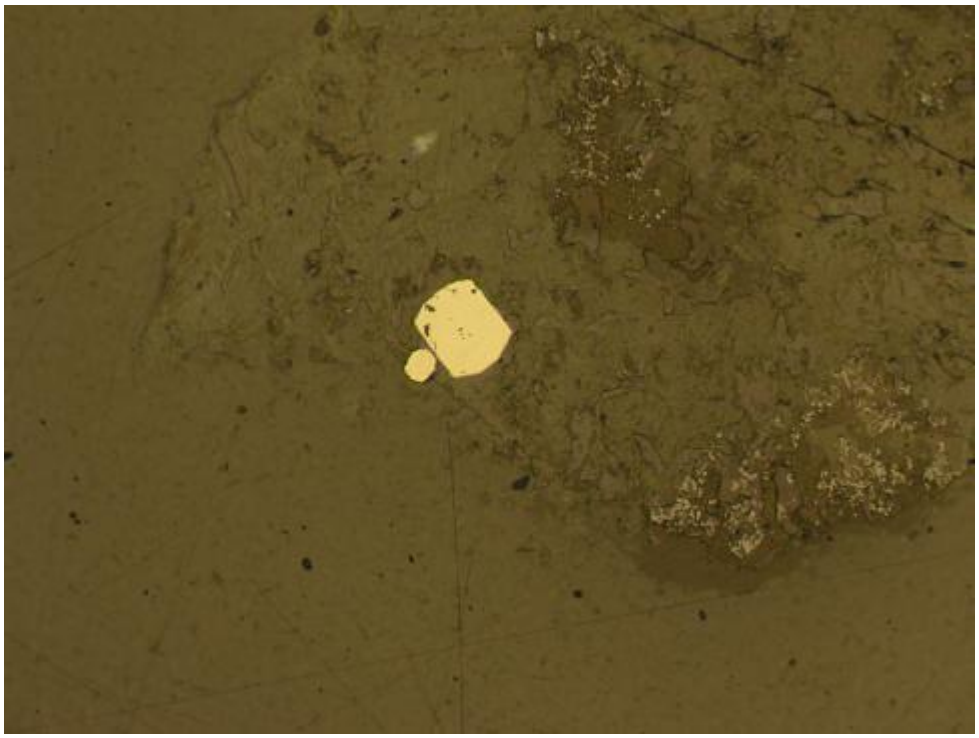


H

HC-51: G) Disseminated unaltered pyrite (right) and traces of chalcopyrite (top left). RL, FOV =~ 2.6 mm. H) Subhedral disseminated pyrite with straight unaltered boundaries. RL, FOV =~ 1.3 mm.

Project: Hope Bay **Deposit:** Doris **Zone:**
Rock Type: Quartz vein
Sample ID: HC-52 **Offcut #**: AP-8

Crushed Rock and Offcut Mount Description:
Fine to coarse angular chips (less than 15 mm size). Chips comprise mostly white quartz vein (~80%) and foliated greyish-brown rock fragments with minor fine-grained pyrite disseminated and in bands parallel to the foliation. No reaction of chips to cold dilute HCl. No reaction of chips to magnet. No reaction of rock chips to etching with HF and staining with sodium cobaltinitrite (no yellow stain).

Polished Thin Section Description:
Fine to coarse chips representing altered rock and vein fragments: 1) fine to very fine-grained, strongly foliated sericite-rutile±carbonate±quartz ±pyrite aggregate with sericite and rutile defining the orientation of the foliation, 2) fine to very fine-grained, massive carbonate-quartz-sericite-rutile±?clay/chlorite ±pyrite aggregate and 3) fine to coarse-grained quartz vein fragments, locally with traces of patchy fine-grained carbonate and rarely with very fine chlorite as fracture infill. Quartz, approximately 80%, occurs as very fine to coarse-grained (< 8 mm) anhedral aggregates in vein fragments. Vein quartz commonly has undulose extinction and locally development of subgrains. Sericite, ~6%, occurs as very fine-grained flaky aggregates within rock fragments. Minor rutile, ~ 1%, occurs as very fine-grained aggregates forming discontinuous bands in rock fragments, as clusters and disseminated. Brownish-green ?clay/chlorite occurs in trace amounts as very fine-grained aggregates in some rock fragments and as rarely as fracture infill within quartz veinlets.

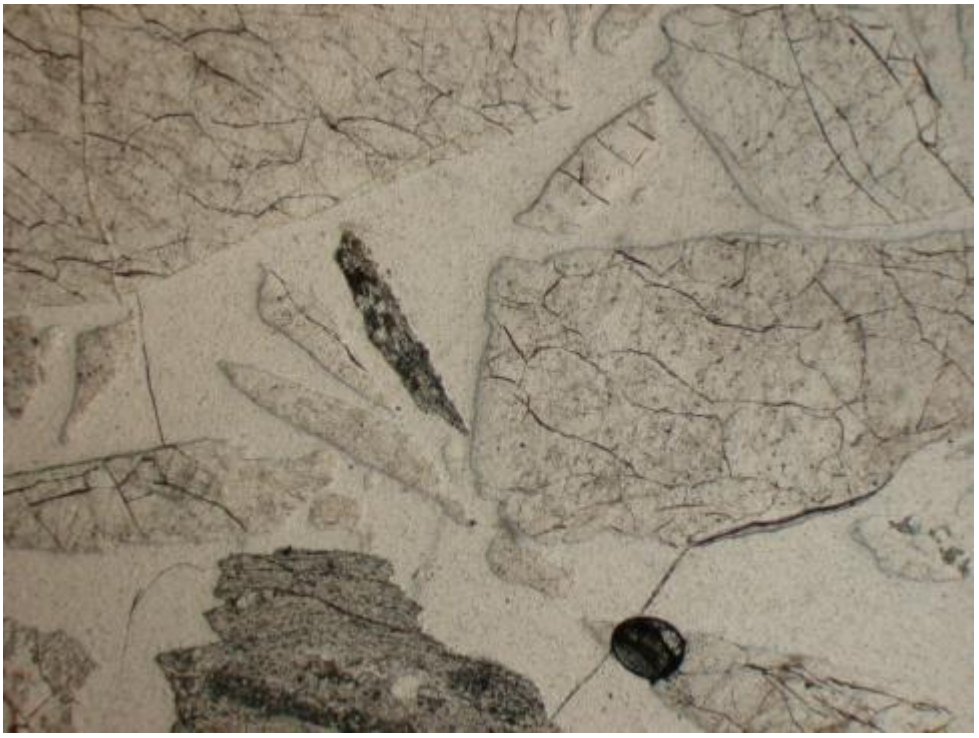
Carbonate occurs in major amounts (~10%) as colourless to cloudy carbonate in the following forms: 1) fine to very fine-grained (< 0.8 mm), anhedral colourless to cloudy aggregates within massive to foliated rock fragments and 2) very fine to fine-grained cloudy aggregate (< 0.2 mm) in vein fragments and rarely 3) as fine cloudy liberated grains. Note some of the carbonate is strained with local development of undulatory extinction. Rarely, very fine-grained red-brown Fe-ox occur partly replacing carbonate at edges of vein fragments.

Sulphide occurs in minor amounts (2%) as pyrite. Pyrite grains are fine to very fine grained (< 1 mm) and occur disseminated in some altered rock fragments and as liberated grains. Pyrite grains have irregular to straight grain boundaries which are unaltered.

Tabular summary (visual estimate):

Sample # -	**Sulphide**	**% ~**	**Carbonate occurrence**	**% ~**	**Fe-Ox**	**% ~**	**Other**	**% ~**
HC-52	pyrite	2	colourless to cloudy very fine to fine-grained	10	red-brown unknown	r.	quartz	80
							sericite	6
							rutile	1
							?clay/chlorite	tr

Abbreviations: tr = trace (< 1%); r. = rare; x = none observed
-fine-grained = > 0.05 mm and < 1 mm; very fine-grained = < 0.05 mm; medium-grained = 1-5 mm
-Fe-ox = iron and/or Fe-Ti-oxides, includes amorphous, very fine-grained poorly crystalline and/or crystalline ferric hydroxides, oxides, oxyhydroxides, hydroxy-sulphate and/or oxyhydroxy-sulphate minerals



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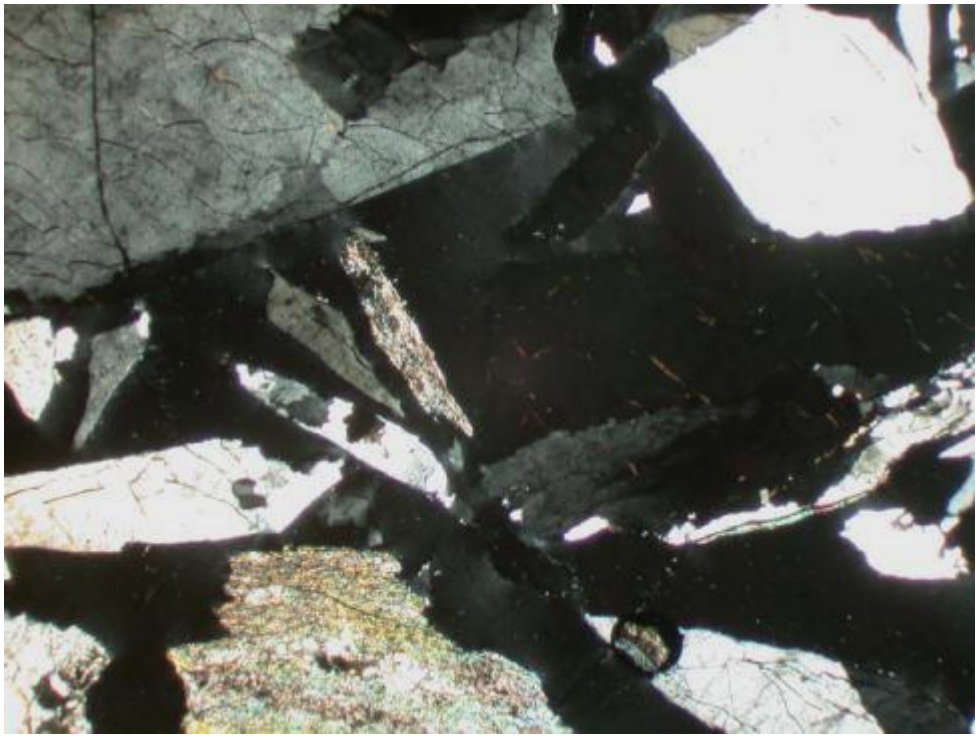
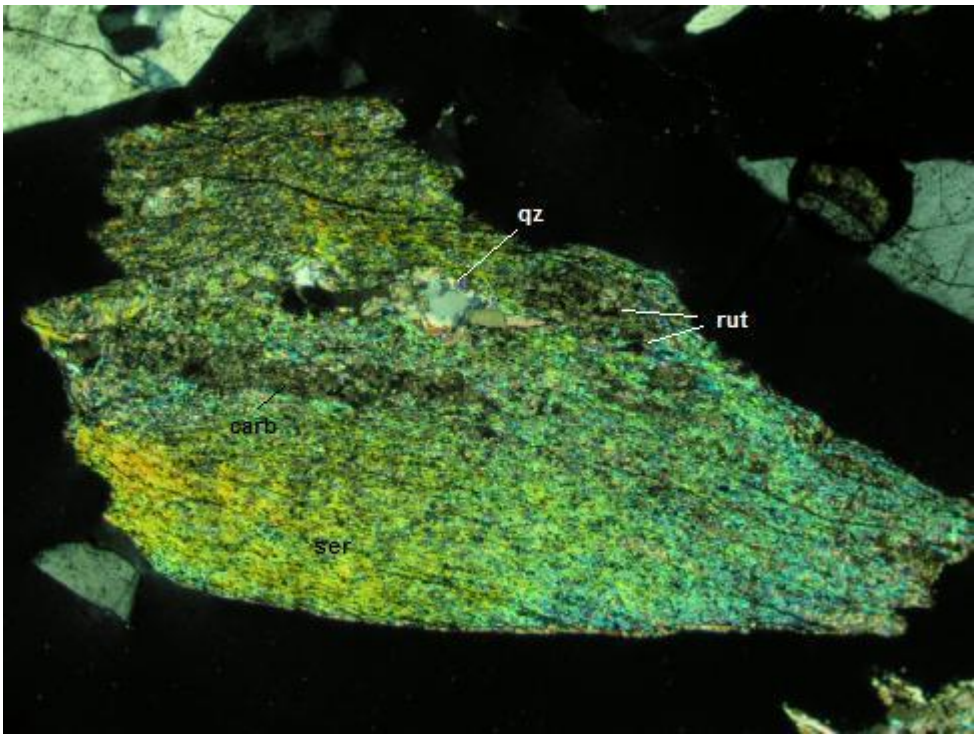


B

HC-52: A&B) View of foliated sericite-rutile±carbonate±quartz aggregate (centre and lower left) and quartz vein fragments. A) PPL, B) XPL, FOV =~ 4.5 mm.



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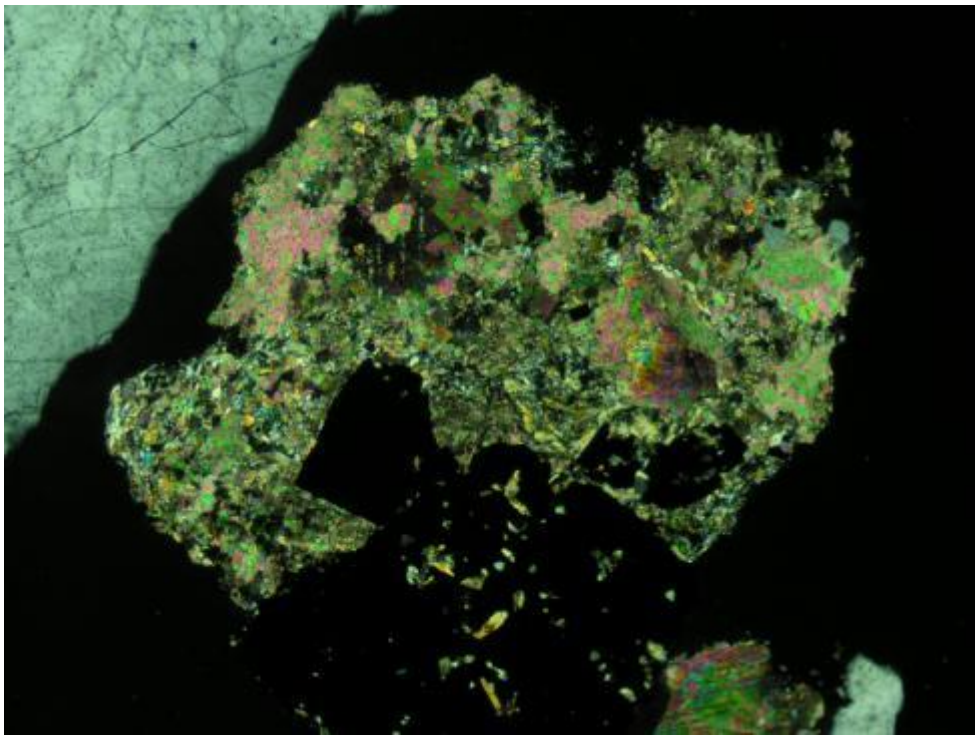
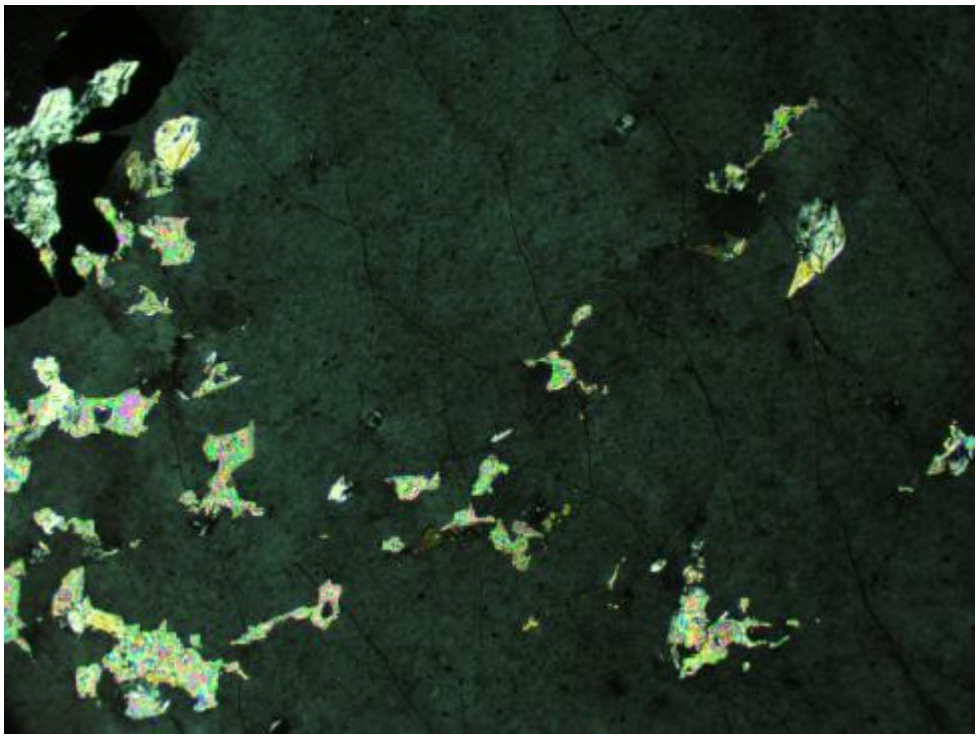


D

HC-52: C) Detailed view of fragment of foliated sericite-rutile±carbonate±quartz aggregate aggregate. FOV =~ 2.6 mm, XPL. D) Detailed view of fragment of massive carbonate-sericite-quartz-rutile-pyrite aggregate. FOV =~ 2.6 mm, XPL.



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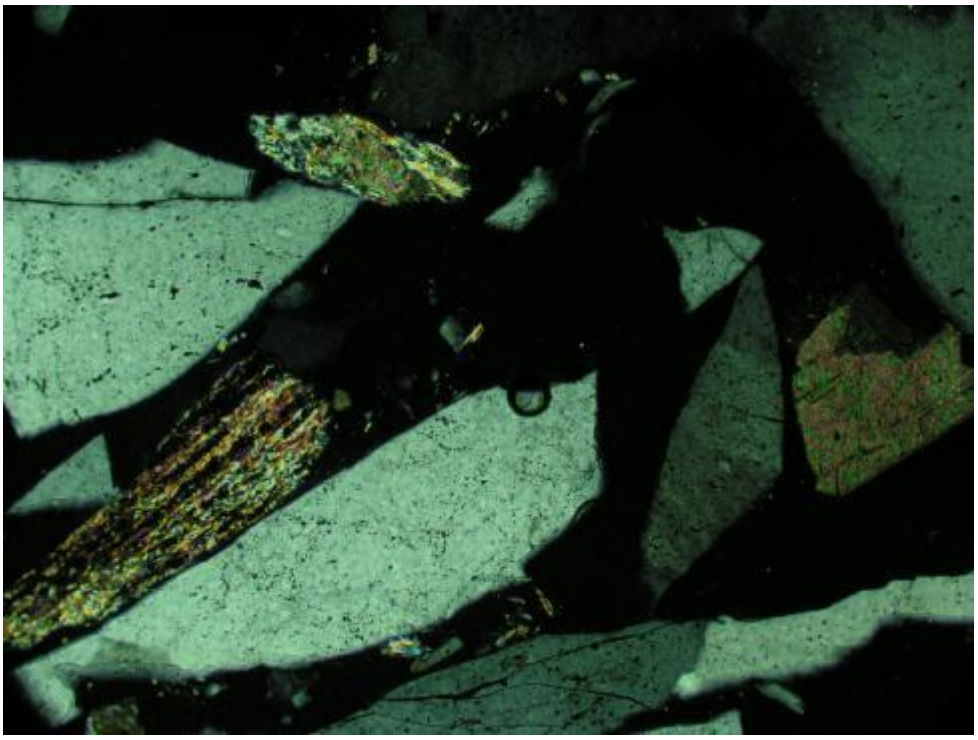
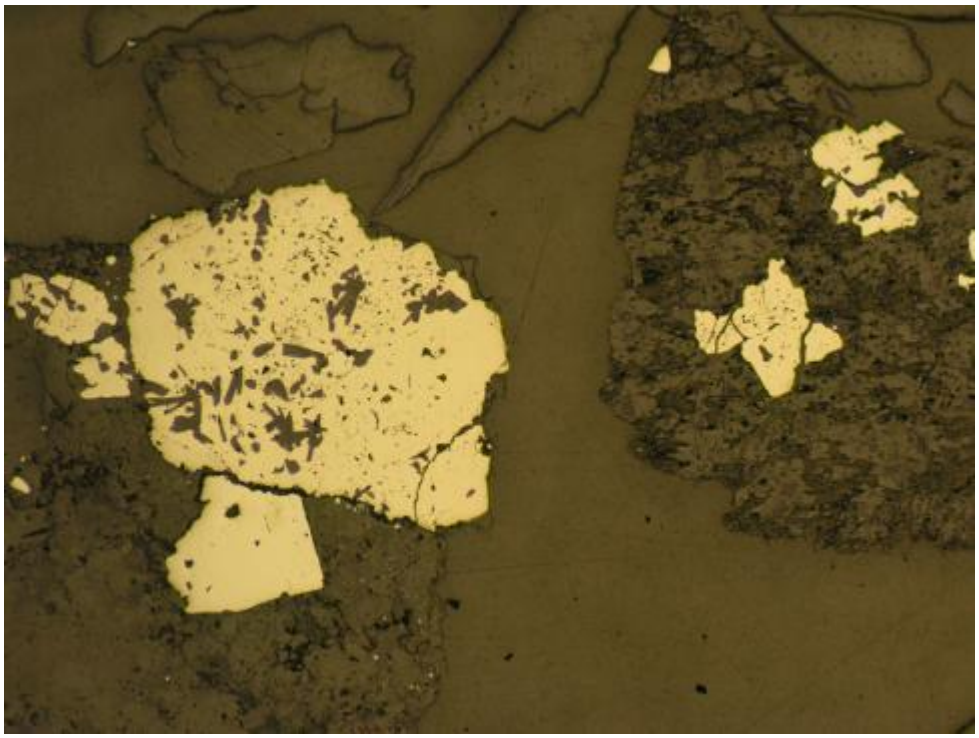


F

HC-52: E) Detailed view of patchy carbonate within quartz vein fragment. XPL, FOV =~ 1.3 mm. F) Detailed view of quartz vein fragments, liberated carbonate grain (right) and sericite-rutile aggregate (left top and bottom). XPL, FOV =~ 2.6 mm.



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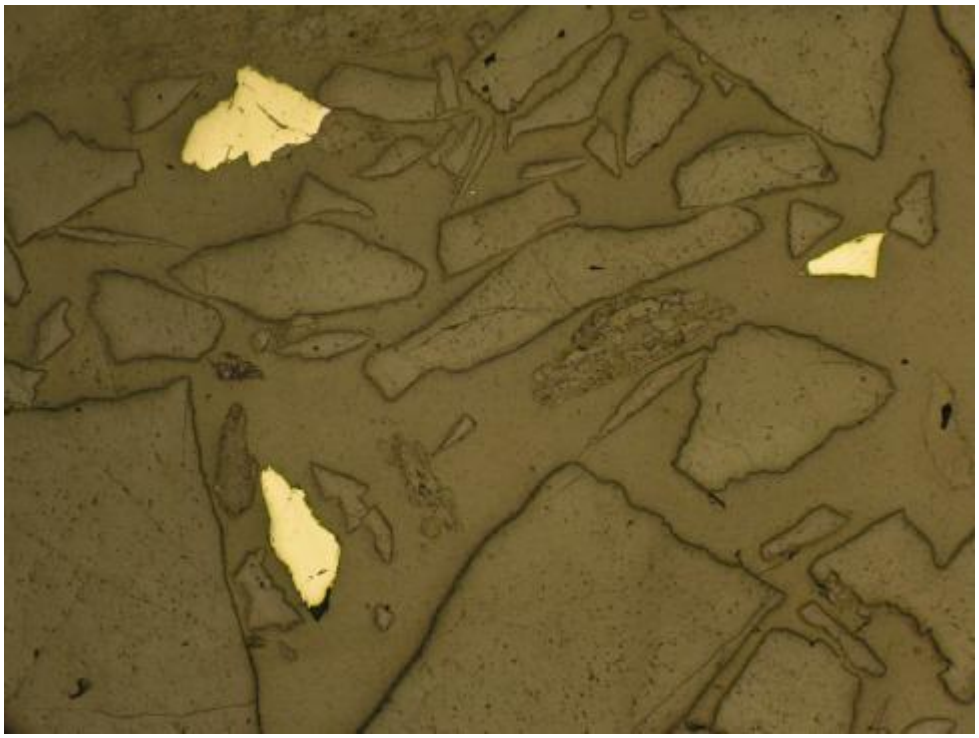


H

HC-52: G) Disseminated unaltered pyrite grains and aggregate within rock fragments. RL, FOV =~ 2.6 mm. H) Liberated pyrite grains (unaltered). RL, FOV =~ 2.6 mm.

Project: Hope Bay **Deposit:** Doris **Zone:**
Rock Type: Quartz vein
Sample ID: HC-53 **Offcut #**: AP-9

Crushed Rock and Offcut Mount Description:
Fine to coarse angular chips (less than 24 mm size). Chips comprise mostly white quartz vein (~99%) and minor foliated greyish-brown rock fragments. No reaction of chips to cold dilute HCl. No reaction of chips to magnet. No reaction of rock chips to etching with HF and staining with sodium cobaltinitrite (no yellow stain).

Polished Thin Section Description:
Fine to coarse chips representing quartz vein fragments. Traces of patchy fine to very fine-grained carbonate associated with sericite aggregate occur within some of the vein fragments. Traces of sericite±rutile, locally tourmaline and brownish-green ?clay/chlorite aggregate are developed at quartz grain boundaries in some fragments. Quartz, approximately 99%, occurs as very fine to coarse-grained (< 7 mm) anhedral aggregates in vein fragments. Vein quartz commonly has undulose extinction and locally development of subgrains. Trace sericite occurs as very fine-grained anhedral to flaky aggregates as patches in the vein fragments. Traces of rutile occurs as very fine-grained aggregates associated with sericite aggregate. Rare traces of tourmaline occur as very fine needles associated with patchy very fine brownish-green ?clay/chlorite aggregate and locally associated with sericite and carbonate aggregate.

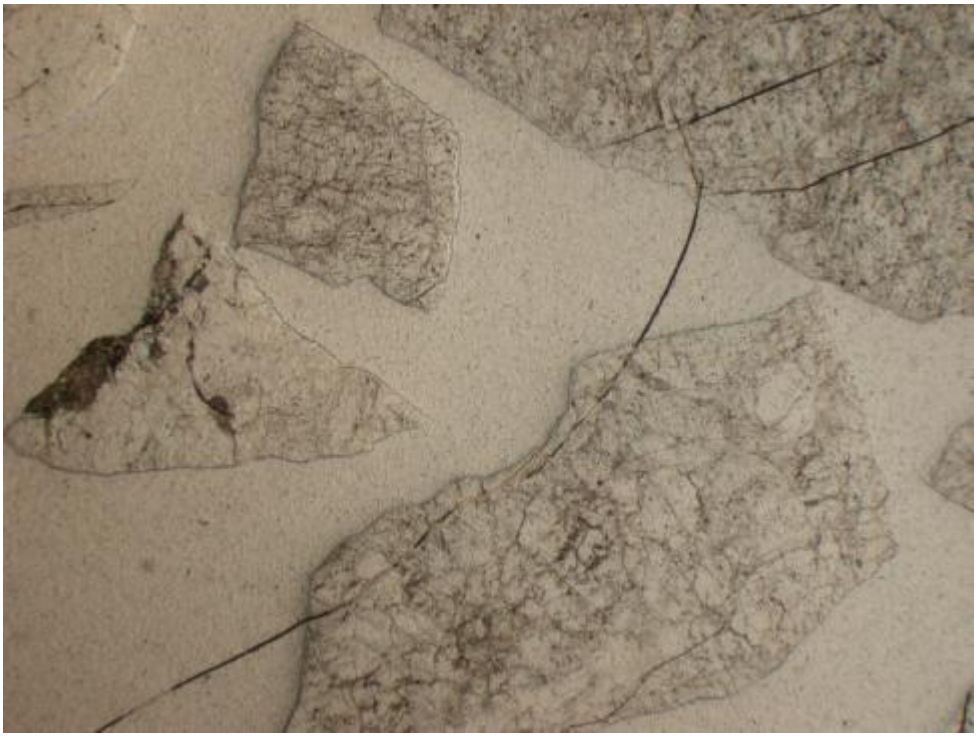
Carbonate occurs in trace amounts as colourless to cloudy brownish carbonate. The carbonate is fine to very fine-grained (< 0.2 mm), anhedral and occurs as patchy aggregates commonly associated with sericite in the quartz vein fragments. Note some of the carbonate is strained with local development of undulatory extinction.

Sulphide occurs in trace amounts as pyrite. Pyrite grains are fine to very fine-grained (< 0.15 mm) and occur disseminated in quartz vein fragments and associated with patchy sericite±clay aggregate. Pyrite grains have irregular to straight grain boundaries which are unaltered.

Tabular summary (visual estimate):

Sample # -	**Sulphide**	**% ~**	**Carbonate occurrence**	**% ~**	**Fe-Ox**	**% ~**	**Other**	**% ~**
HC-53	pyrite	tr	colourless to cloudy brownish, very fine to fine-grained	tr		x	quartz	99
							sericite	tr
							rutile	tr
							?clay/chlorite	tr
							tourmaline	r.

Abbreviations: tr = trace (< 1%); r. = rare; x = none observed
-fine-grained = > 0.05 mm and < 1 mm; very fine-grained = < 0.05 mm; medium-grained = 1-5 mm
-Fe-ox = iron and/or Fe-Ti-oxides, includes amorphous, very fine-grained poorly crystalline and/or crystalline ferric hydroxides, oxides, oxyhydroxides, hydroxy-sulphate and/or oxyhydroxy-sulphate minerals



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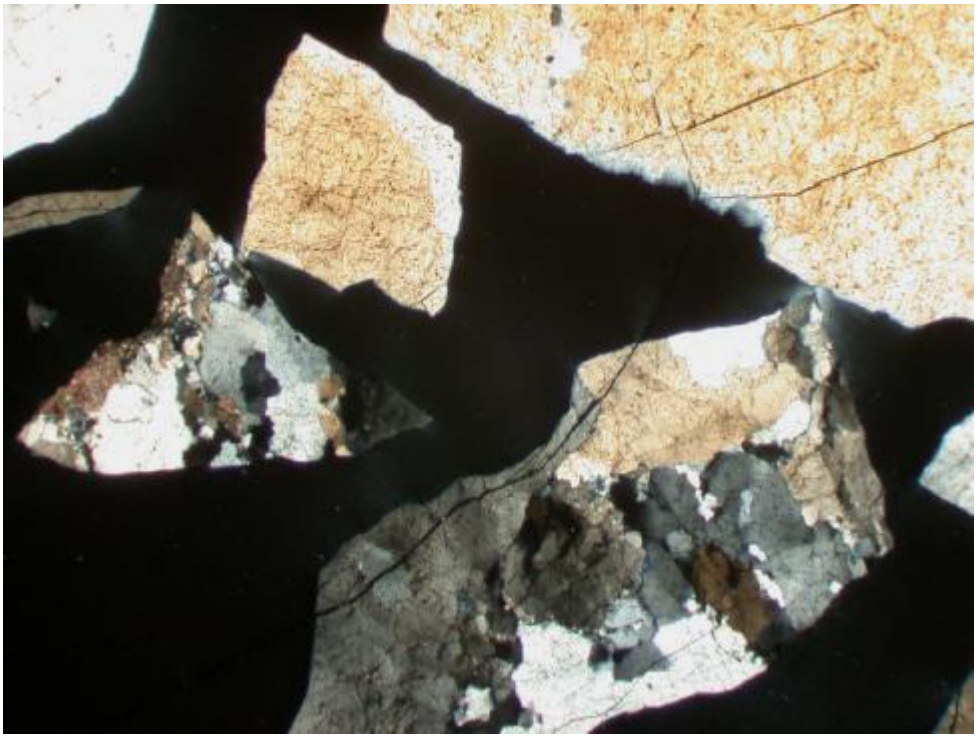
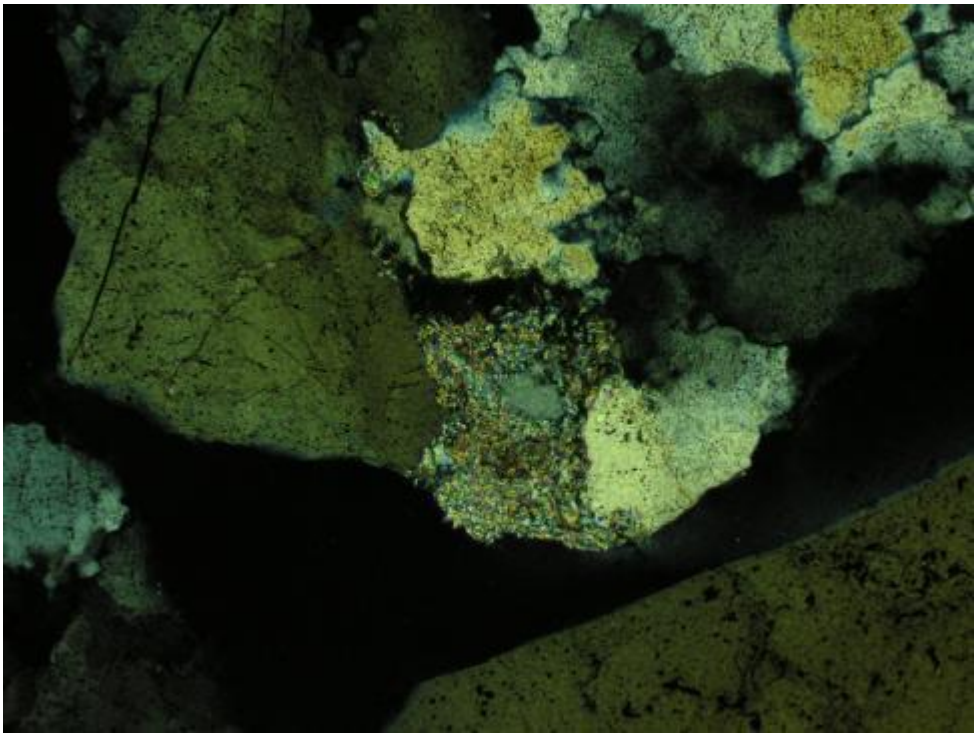


B

HC-53: A&B) View of quartz vein fragments. Note patchy carbonate aggregate within vein fragment (left). A) PPL, B) XPL, FOV =~ 4.5 mm.



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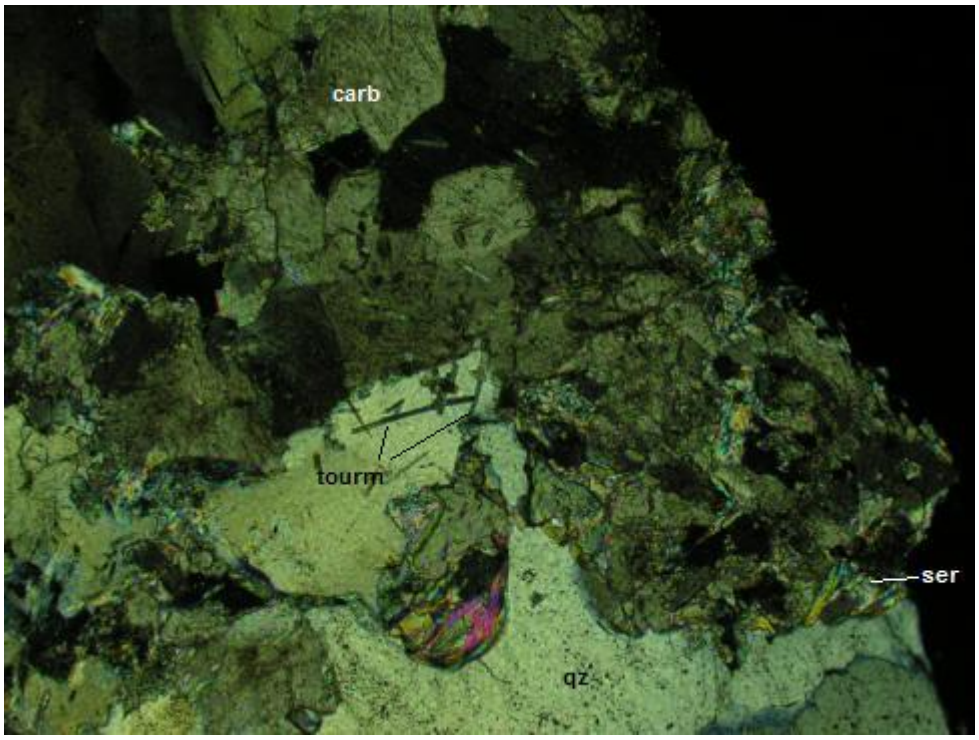
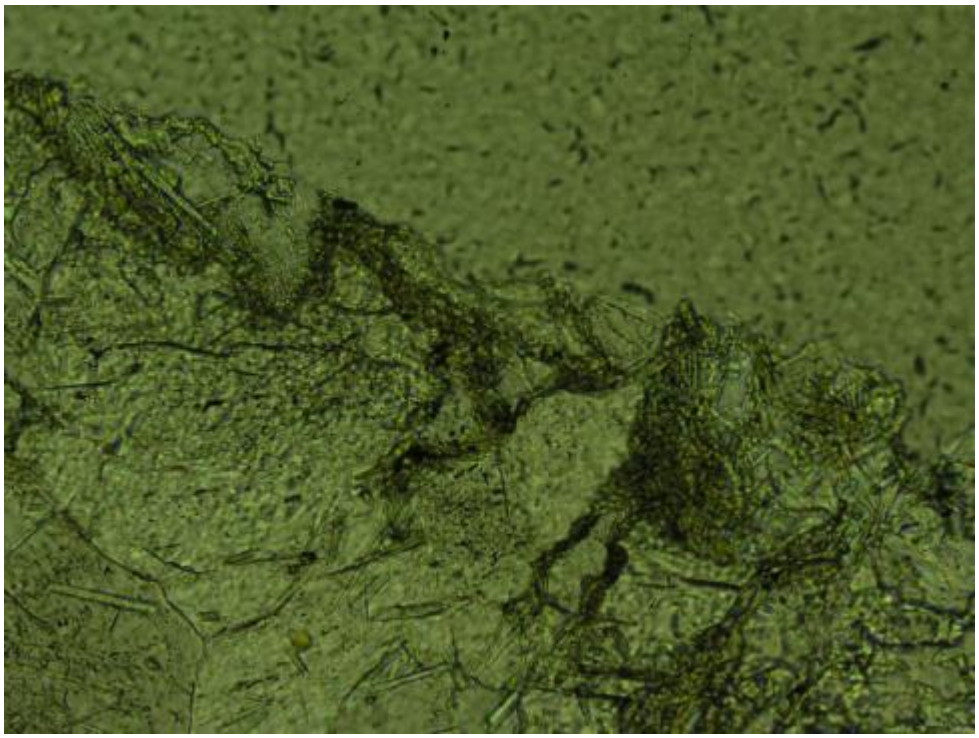


D

HC-53: C) Detailed view of very fine-grained sericite aggregate aggregate within quartz vein fragment. FOV =~ 1.3 mm, XPL. D) Detailed view of patchy carbonate-sericite-(tourmaline) aggregate within quartz vein fragment. FOV =~ 1.3 mm, XPL.



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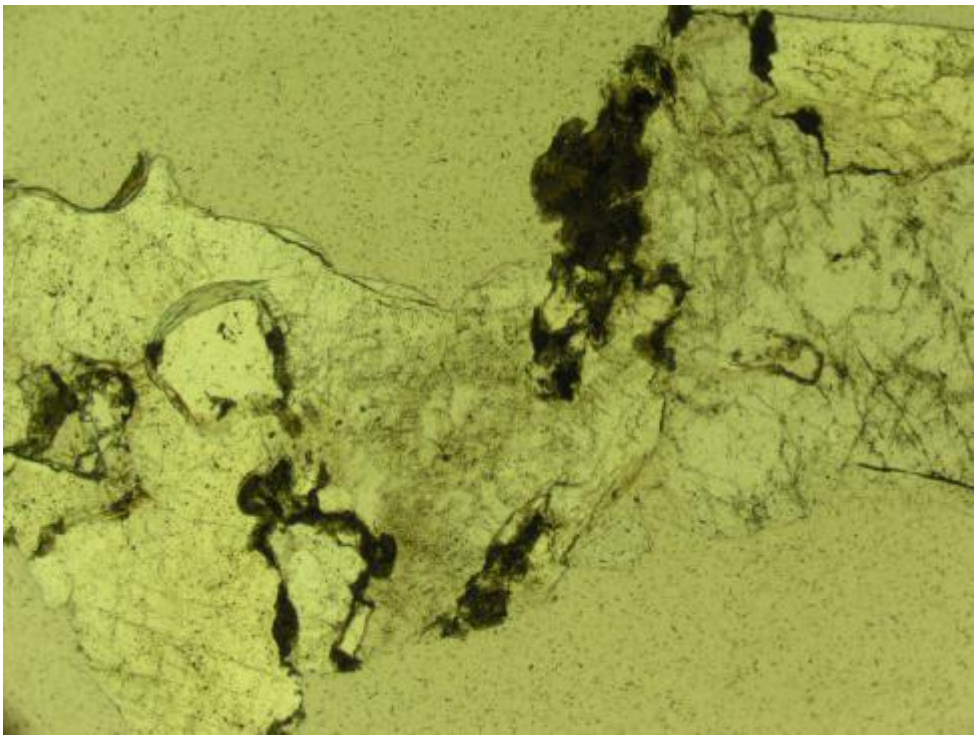
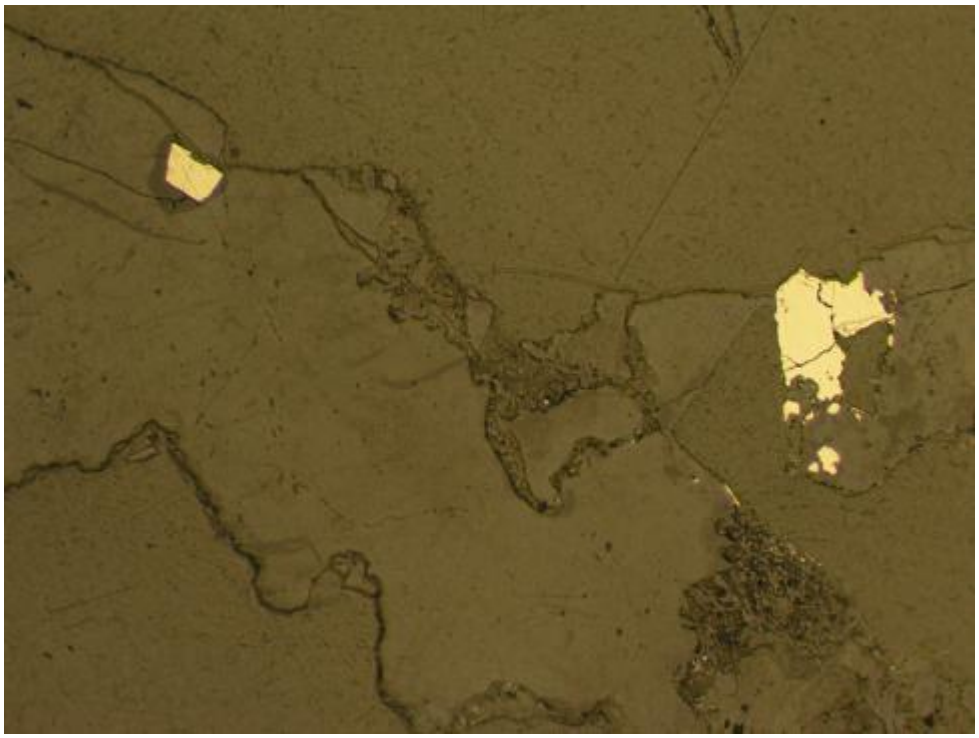


F

HC-53: E) Detailed view of acicular tourmaline and aphanitic brownish-green aggregate within quartz vein fragment. PPL, FOV =~ 0.7 mm. F) Detailed view of quartz vein fragments with aphanitic brownish-green ?clay/chlorite aggregate developed at grain boundaries. PPL, FOV =~ 2.6 mm.


G

HC-53: G) Detailed view of anhedral pyrite grains within quartz vein fragment. RL, FOV =~ 0.7 mm.

Project: Hope Bay **Deposit:** Boston **Zone:**
Rock Type: Mafic volcanic: Basalt
Sample ID: HC-55 **Offcut #**: AP-10

Crushed Rock and Offcut Mount Description:
Fine to coarse angular chips (less than 13 mm size). Chips comprise mostly light olive-grey strongly foliated rock, banded green-brown rock and white quartz vein fragments. Traces of fine-grained pyrite occurs disseminated. No reaction of chips to cold dilute HCl. No reaction of chips to magnet. Rare traces of reaction of rock chips to etching with HF and staining with sodium cobaltinitrite (trace yellow stain).

Polished Thin Section Description:
Fine to coarse chips representing altered and variably deformed rock: 1) fine to very fine-grained, strongly foliated chlorite-quartz-plagioclase-rutile-carbonate±sericite aggregate with chlorite and locally rutile and sericite defining the orientation of the foliation, 2) fine to very fine-grained massive quartz-carbonate aggregate locally with minor sericite, 3) fine-grained, anhedral carbonate aggregate, 4) very fine to medium-grained quartz and carbonate-quartz vein fragments and 5) rarely strongly foliated, very fine-grained sericite aggregate with radiating fine tourmaline, very fine bands of rutile and disseminated pyrite. Carbonate, quartz and pyrite occur commonly as liberated grains. Chlorite comprises approximately 10% of the section as very fine-grained aggregates within strongly foliated rock fragments. Minor rutile, approximately 1%, occurs as very fine-grained aggregates within the foliation, as clusters and disseminated. Quartz, approximately 25%, occurs as fine to very fine-grained (< 1 mm) patchy, anhedral aggregates commonly with undulose extinction and development of subgrains. Traces of quartz occur as fine to very fine-grained pressure fringes to pyrite and carbonate porphyroblasts. Sericite, ~ 10%, occurs as fine to very fine-grained (< 0.15 mm) flaky aggregates. Minor plagioclase, ~2% occurs as very fine aggregate within strongly foliated fragments.

Carbonate occurs in major amounts (~50%) as colourless and cloudy brownish carbonate in the following forms: 1) fine to very fine-grained (< 0.15 mm), anhedral to rhombic colourless aggregates within foliated chlorite-quartz-plagioclase-rutile-carbonate±sericite fragments, 2) fine to very fine-grained (< 0.1 mm), anhedral aggregates within carbonate and quartz-carbonate aggregate, 3) fine to medium-grained aggregate (< 2 mm) in vein fragments and 4) as fine-grained liberated grains (< 0.2 mm). Approximately half the carbonate, particularly the vein carbonate is cloudy and brownish. Note some of the carbonate is strained with local development of undulatory extinction and subgrains.

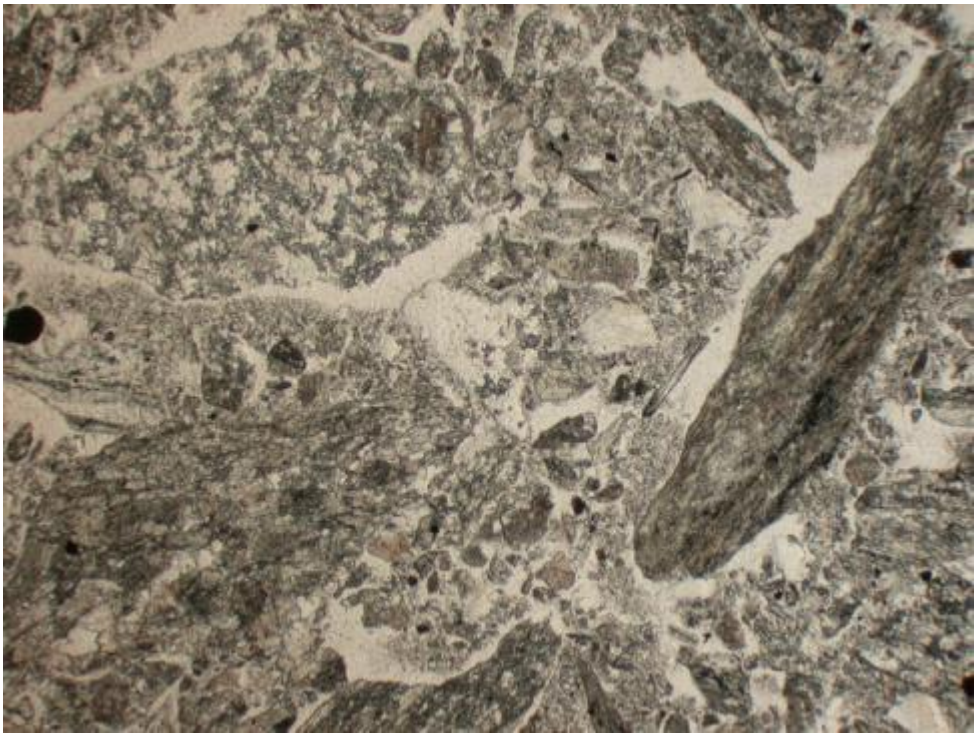
Sulphide occurs in minor amounts (~1%) as pyrite, in trace amounts as chalcopyrite and rarely as an unknown phase. Pyrite grains are fine to very fine grained (< 0.45 mm) and occur as disseminated to patchy sub-anhedral grains and aggregate in altered rock fragments and as liberated anhedral grains. Pyrite grains have irregular to straight grain boundaries which are unaltered. Traces of fine to very fine-grained (< 0.1 mm) chalcopyrite occur disseminated in rock fragments, as infill to pyrite and as inclusions in pyrite. Rarely grains of an unknown highly reflective, weakly anisotropic phase occur as patchy fine to very fine-grains (< 0.2 mm) in quartz-carbonate aggregate. The unknown grains resemble pyrite but are white rather than yellowish white in reflected light.

Project: Hope Bay **Deposit:** Boston **Zone:**
Rock Type: Mafic volcanic: Basalt
Sample ID: HC-55 **Offcut #**: AP-10

Tabular summary (visual estimate):

Sample # -	**Sulphide**	**% ~**	**Carbonate occurrence**	**% ~**	**Fe-Ox**	**% ~**	**Other**	**% ~**
HC-55	pyrite	1	colourless to cloudy	50		x	quartz	25
	chalcopyrite	tr	brownish, fine to very				chlorite	10
	unknown	r.	fine-grained				sericite	10
							plagioclase	2
							rutile	1
							tourmaline	r.

Abbreviations: tr = trace (< 1%); r. = rare; x = none observed
-fine-grained = > 0.05 mm and < 1 mm; very fine-grained = < 0.05 mm; medium-grained = 1-5 mm
-Fe-ox = iron and/or Fe-Ti-oxides, includes amorphous, very fine-grained poorly crystalline and/or crystalline ferric hydroxides, oxides, oxyhydroxides, hydroxy-sulphate and/or oxyhydroxy-sulphate minerals



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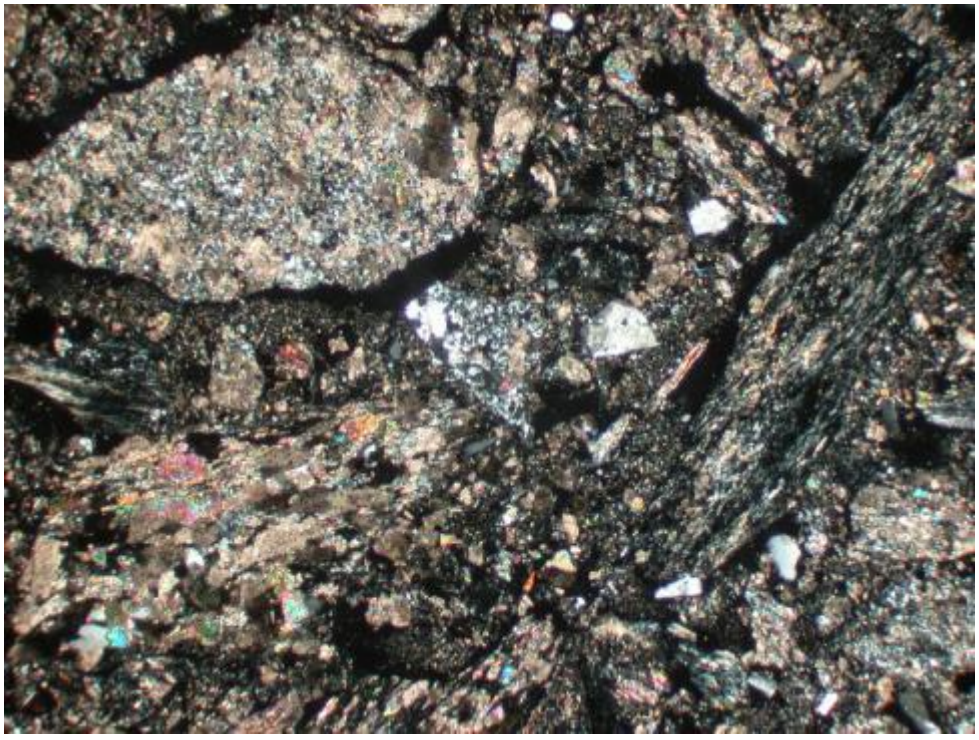
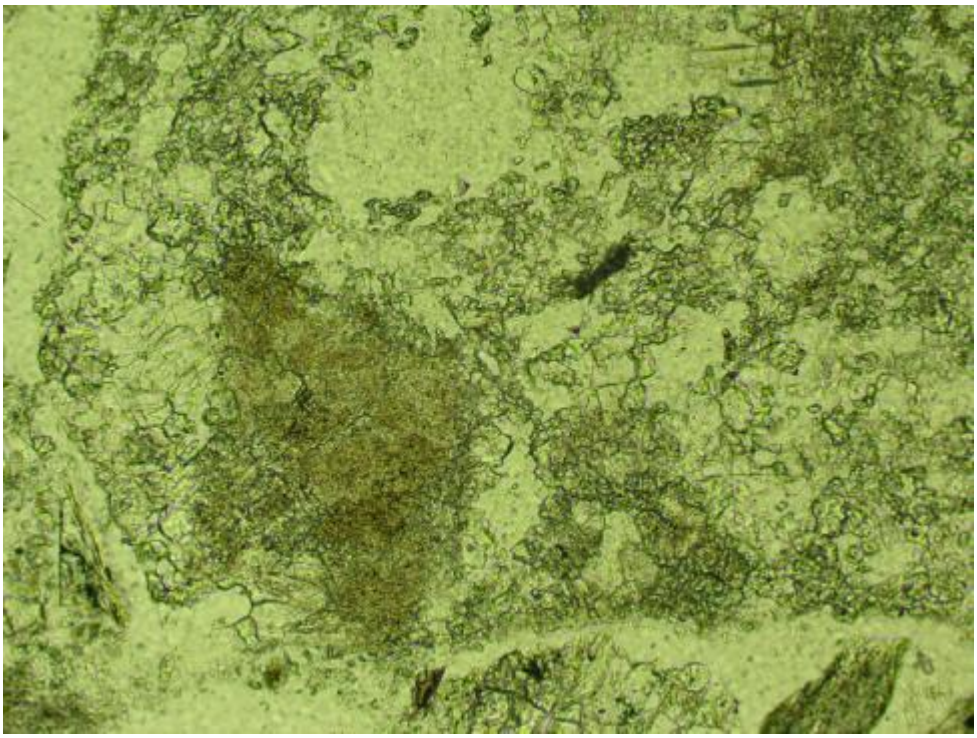
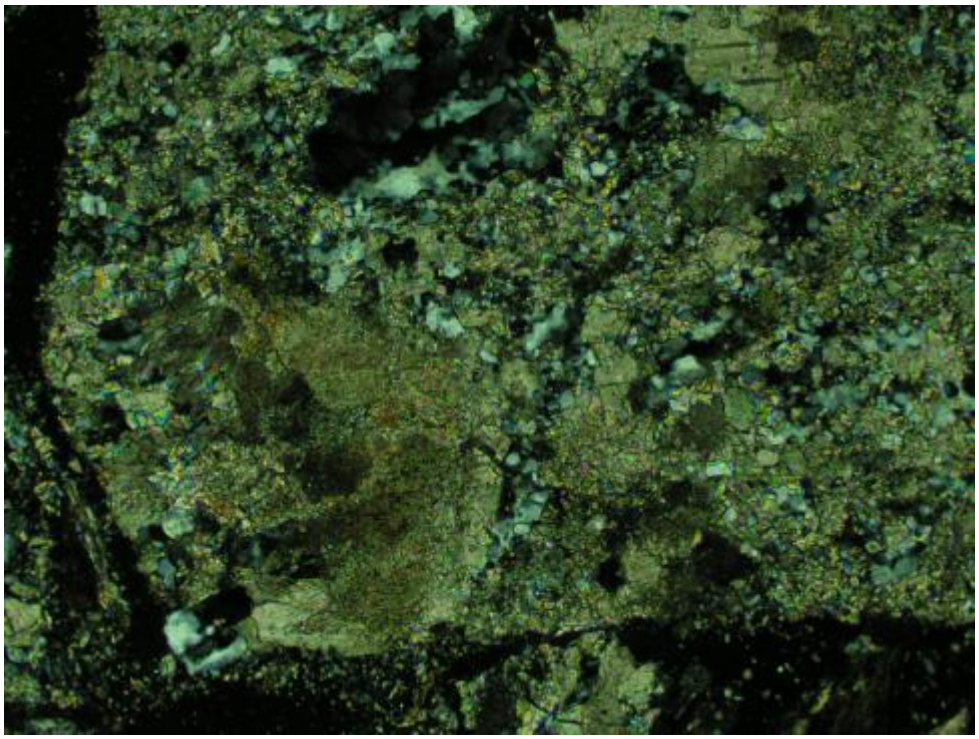


B

HC-55: A&B) View of altered and deformed rock rock chips including strongly foliated chlorite-quartz-plagioclase-rutile-carbonate-sericite aggregate (right), massive quartz-carbonate aggregate (top left) and carbonate aggregate (lower left). A) PPL, B) XPL, FOV =~ 4.5 mm.

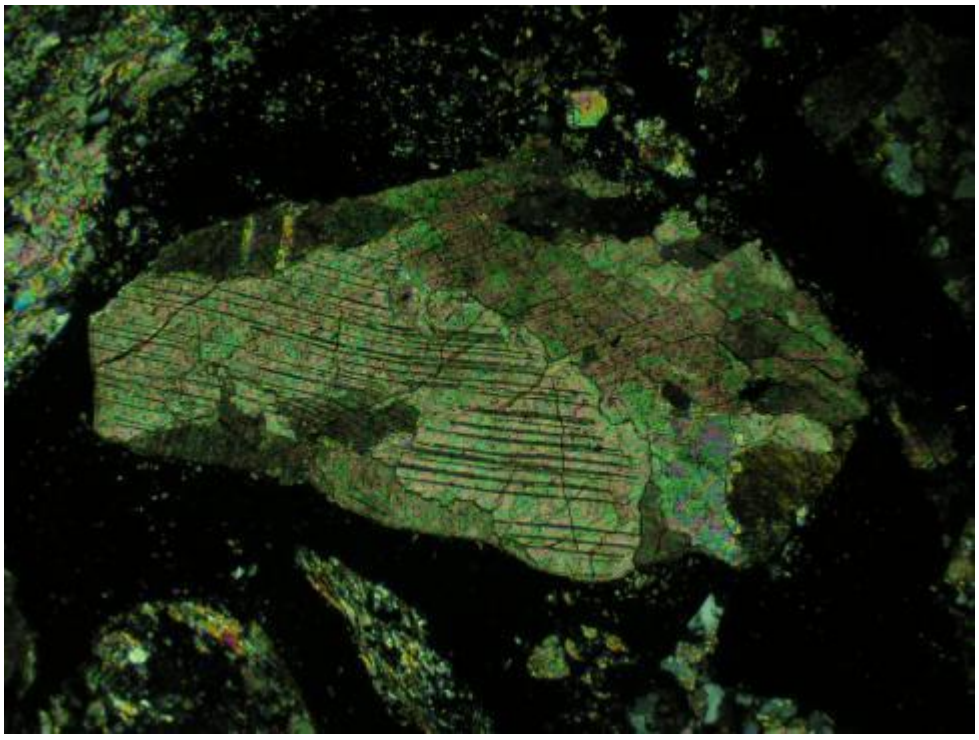


C

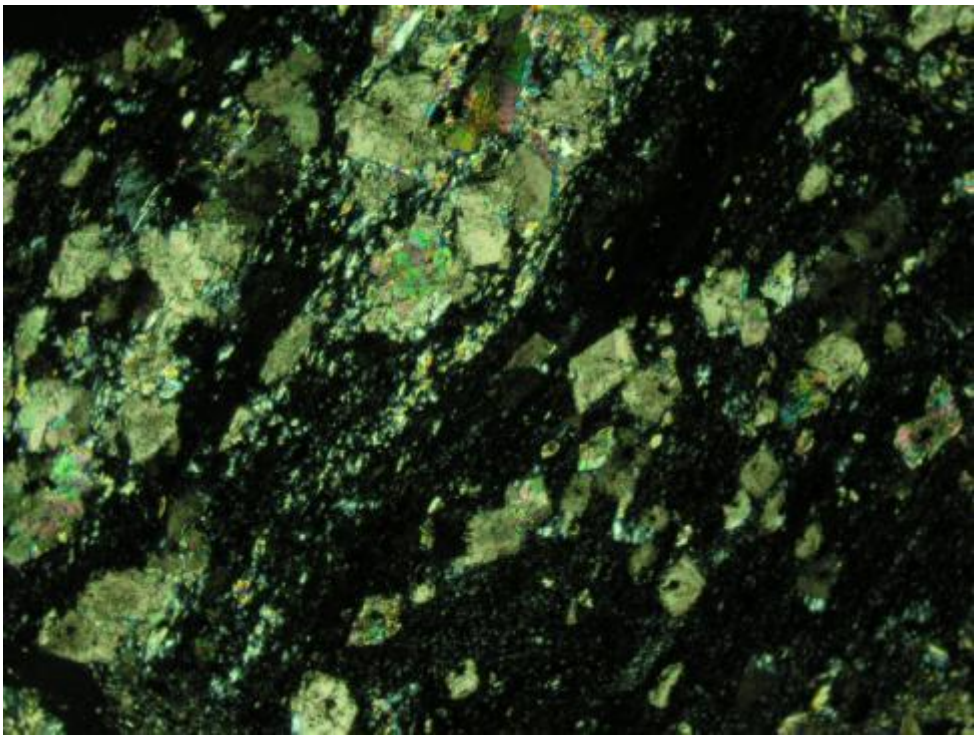


D

HC-55: C&D) Detailed view of massive quartz-carbonate rock fragment. Note patches of cloudy brownish carbonate. FOV =~ 2.6 mm, C) PPL, D) XPL.

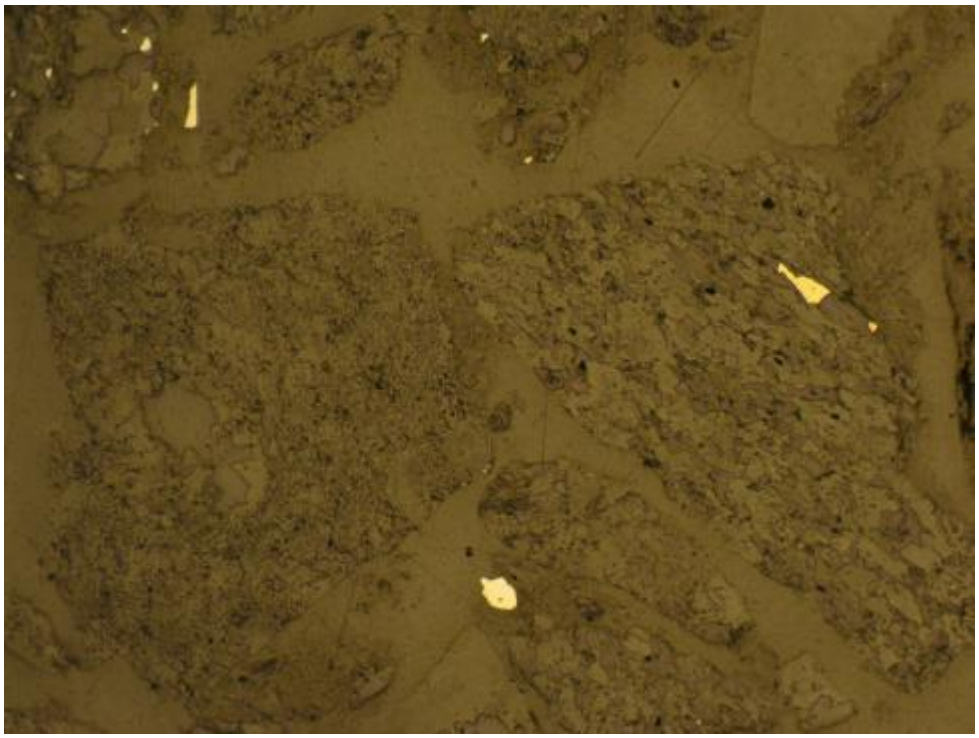


E

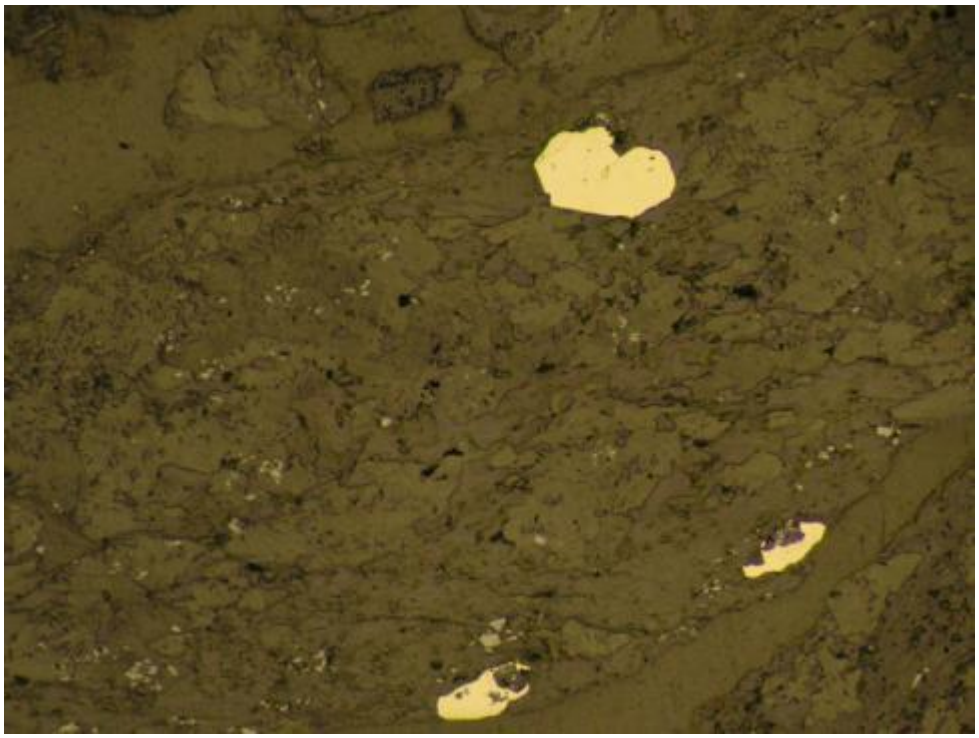


F

HC-55: E) Fragment of fine-grained anhedral carbonate aggregate. XPL, FOV =~ 1.0 mm. F) Anhedral to rhombic colourless carbonate within foliated chloritic rock fragment. XPL, FOV =~ 2.6 mm.

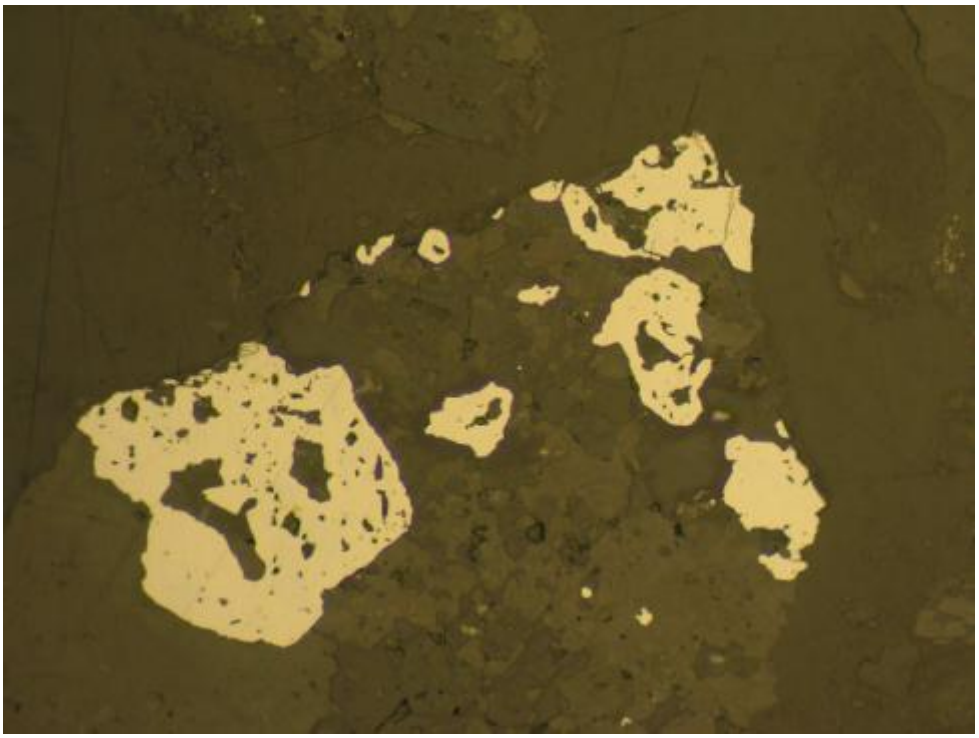


G



H

HC-55: G) Pyrite as disseminated and liberated grains. Traces of disseminated chalcopyrite. RL, FOV =~ 2.6 mm. H) Anhedral pyrite grains and traces of rutile within massive quartz-carbonate aggregate. RL, FOV =~ 1.3 mm.



I

HC-55: I) White unknown grains within quartz-carbonate aggregate. RL, FOV =~ 0.3 mm.

Statement of qualifications: Kathryn P.E. Dunne

I, Kathryn P.E. Dunne, of the City of Salmon Arm, province of British Columbia, do hereby certify that:

1. I am an independent consulting geologist, with a business office at 4610 Lakeshore Road NE, Salmon Arm, B.C., Canada. My business mailing address is: Bag 9000, # 207, 190B Trans Can Hwy NE, Salmon Arm, BC, V1E 1S3.

2. I am a graduate in geology, with a BSc in geology from The University of British Columbia (1985).

3. I received my Masters degree in geology from The University of British Columbia, Vancouver, B.C. in 1988.

4. I am a registered member of the Association of Professional Engineers and Geoscientists of the Province of British Columbia (No. 18674).

5. I am a fellow of the Geological Association of Canada and a member of the Society of Economic Geologists and Mineralogical Association of Canada.

6. I have practiced my profession as a geologist for approximately 21 years: 4 years as geologist with the British Columbia Geological Survey Branch, 3 years as research coordinator at the Mineral Deposit Research Unit housed within the Department of Earth and Ocean Sciences at the University of British Columbia, and 14 years as an independent consultant.

7. The petrographic data of this report was collected by me in January and February 2011.

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Kathryn P.E. Dunne, M.Sc., P.Geo.
Consulting Geologist
February 7, 2011