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PETROGRAPHIC REPORT ON SAMPLES FROM GOATFELL PROPERTY

FOR

CHEVRON MINERALS LTD.

BY

J.S. GETSINGER, Ph.D.

DECEMBER 2, 1988

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SUMMARY OF PETROGRAPHY ON FIVE SAMPLES FROM THE GOATFELL PROPERTY

Description of Samples

Five samples were selected from drill hole DDH-1 on the Goatfell property for thin section interpretation (DDH1-Bx55 (298 m), DDH11-1004' (306 m), DDH1-1073' (327 m), DDH1-1117' (340 m), and DDH1-1139.5' (347 m)).

All 5 rocks are meta-siltstone to fine sandstone, with some variation in mineralogy and texture. Mineralogy consists of 40 to 60% quartz, up to 15% feldspar (plagioclase ± K-feldspar), 10 to 45% muscovite (including sericite), up to 15% biotite, up to 4% garnet, up to 3-4% opaques, up to 10% carbonate, up to 3% sphene, and up to 1% tourmaline or epidote.

Texture is well-sorted to poorly sorted (within the siltstone to fine sandstone range), clastic to somewhat recrystallized. Sedimentary structures such as bedding, graded bedding, slump folding, and rip-up clasts are well-preserved. Static metamorphic textures are superimposed on the sedimentary textures, as seen in sample DDH1-Bx55 (298 m), with its porphyroblastic and atoll garnets, and in other samples with porphyroblastic muscovite and metamorphic biotite.

In this sample suite, tourmaline does not coexist in equilibrium with biotite, but tends to occur in rocks with greater than 15% muscovite. It occurs as small, individual prisms zoned from bluish-green to brown (up to 1% of rock). Tourmaline was noted in rocks with more structural complexity, such as slump folding, convolute bedding, or microfaulting.

The presence of sphene up to 3% seems excessive for a typical siltstone. It occurs, in part, surrounding opaques (Fe-Ti-oxides (?) such as ilmenite), but also as an alteration associated with tourmaline, related to a crosscutting trend in sample DDH1-1117' (340 m). This suggests that the calcium and/or titanium may have been introduced in fluids along with boron.

Opaques are in general finely disseminated and in small amounts, up to 3-4%. They were observed in hand specimen to consist of pyrrhotite and arsenopyrite, but may also consist of ilmenite, as suggested by alteration to sphene. Some appear to be retrograde reaction products of biotite altering to chlorite, also suggesting Fe-Ti oxides.

Metamorphic minerals are mainly biotite, muscovite, and garnet, with retrograde chlorite, epidote, and muscovite/sericite. Red-brown colour of biotite usually indicates amphibolite facies metamorphism; however, other features in these rocks suggest a lower grade, such as greenschist facies metamorphism. The red-brown colour is believed to reflect Ti-content. It is possible that the metamorphism was more of a metasomatism caused by movement of hydrothermal fluids through the rock rather than typical regional or burial metamorphism.

Garnet porphyroblasts in sample DDH1-Bx55 (298 m) are interesting because some are poikiloblastic whereas others are in ring shapes (atolls) with recrystallized quartz in the core.

Muscovite occurs as porphyroblasts and also as finer grained sericite. The larger flakes are interpreted as porphyroblastic rather than detrital grains because of their randomly distributed orientation and their metamorphic association. For instance, in sample DDH1-Bx55 (298 m), large muscovite grains in one layer are likely to be

porphyroblastic because the rock also contains porphyroblastic garnet and metamorphic biotite. In some rocks the sericite is clearly an alteration of feldspar (DDH1-1139.5' (347 m)) whereas in others it probably represents metamorphically recrystallized argillaceous minerals or layers (DDH1-1117' (340 m)).

Retrograde metamorphic minerals are mainly chlorite, sericite, and minor epidote. Sphene is also seen as an alteration around opaques. Pale green chlorite, with associated opaques, is a common alteration from red-brown biotite. It also occurs along fractures, especially in sample DDH1-1073' (327 m). Epidote was noted around opaques and also as clinozoisite veinlets crosscutting other structures and muscovite porphyroblasts, as in sample DDH1-Bx55 (298 m).

Postmetamorphic alteration consists of late carbonate veinlets (1 mm). They are composed mainly of calcite, but some ankeritic component may also be present (as in sample DDH1-1117' (340 m).

Summary of Geological History

The geological history of the area around drill hole DDH-1 can be summarized briefly using evidence from the 5 samples studied in thin section. Sedimentary deposition of fine sand to silt with some argillite probably occurred in a turbiditic environment, as indicated by slump-folds and possible microfaulting, but there is not enough data from these sample to distinguish lower from middle Aldridge Fm.

Static metamorphism without deformation occurred in conditions approximating upper greenschist facies or perhaps hornblende hornfels facies. The most diagnostic mineral assemblage observed was garnet - biotite - muscovite (+ quartz) ± sphene ± tourmaline. Some metamorphic components may have been introduced by

metasomatism or hydrothermal fluids, such as boron, calcium, titanium. Age relations of tourmaline and other metamorphic minerals are not clear, although tourmaline and sphene appear to be somewhat related to crosscutting trends.

Retrograde metamorphism involved fracturing and hydration of minerals at a lower temperature (such as consistent with lower greenschist facies), with biotite altering to chlorite ± opaques, feldspar and muscovite/sericite altering to a later phase sericite, and epidote/clinozoisite veinlets.

Mineralization consisting of up to 3-4% finely disseminated opaques, possibly including pyrrhotite, arsenopyrite, Fe-Ti oxides and Fe-oxides, may have been primary or metamorphic.

Postmetamorphic alteration consisted of minor carbonate veining (calcite ± ankerite). No penetrative deformation appears to have taken place.

Comparison with Samples from Sullivan and Mt. Mahon

Three samples from other areas were also described in thin section for comparison with the samples from drill hole DDH-1. Samples S-1 and S-2 are from the Sullivan orebody, and sample Mt. Mahon 2 is from Mt. Mahon.

Sample S-1 is supposed to be an example of a chloritized siltstone from the Sullivan Hanging Wall. It is a mineralized siltstone, but there is hardly any chlorite in it. The dominant alteration products are fine-grained garnet and quartz, with lesser biotite, plagioclase, and minor chlorite. The disseminated opaques, mainly pyrrhotite, are also locally altered to red hematite.

Sample S-2 is an example of the Sullivan Tourmalinite Footwall. It is an altered granule conglomerate with clasts of siltstone and shale as well as quartz grains. Both the clasts and matrix have been altered to a dirty brown mat of fine-grained crystals which are likely to be tourmaline, in comparison with previous descriptions. The tiny needles are colourless to pale green, but with no visible pleochroism, unlike most tourmaline; and length fast, consistent with a uniaxial negative mineral. Carbonate and muscovite alteration are intimately associated with opaques, which are disseminated throughout in a small amount (3-4%) as lumpy, skeletal grains.

Sample Mt. Mahon 2 is a tourmalinized turbiditic siltstone with fine-grained, altered shaly layers. As well as fine, very pale green tourmaline(?) needles forming a brown mat-like alteration (up to 30%), there are also larger, individual grains of tourmaline ($<1\%$) which can be positively identified as such because of distinctive green to tan pleochroism ($O > E$).

The samples from DDH-1 are also altered siltstone, but none show the pervasive fine-grained tourmaline alteration typical of Sullivan or Mt. Mahon.

II. PETROGRAPHIC DESCRIPTIONS

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STATEMENT OF QUALIFICATIONS

I, Jennifer S. Getsinger, do hereby certify:

1. That I am a geologist employed by Chevron Minerals Ltd. with offices at 1900 - 1055 West 1055 West Hastings Street, Vancouver, B.C. V6E 2E9.

2. That I have studied geology at Harvard University (A.B. 1974), and have graduate degrees in geology from the University of Washington, Seattle (M.S. 1978), and from the University of British Columbia, Vancouver (Ph.D. 1985).

3. That I have practiced within the geological profession since 1974.

4. That I am a Fellow of the Geological Association of Canada and a member of the Geological Society of America.

5. That the opinions, conclusions and recommendations contained herein are based in part on petrographic analysis and research carried out by me.

6. That I hold no direct or indirect interest nor do I expect to receive any interest in the property or in any securities of the owner or operator of the property, or in any associated companies.

7. That this report may be utilized for inclusion in a Prospectus or Statement of Material Facts.

Signed _____

Jennifer S. Getsinger, Ph.D.

December 2, 1988
Vancouver, B.C.

PETROGRAPHIC REPORT by J.S. Getsinger, PhD

For: Chevron Minerals Ltd. Date: 88-11
Project: Goatfell - M586 Collector: M.W. Hitzman
Sample: M586-DDH1-Bx55 (298 m) Date Collected: 1988

LOCATION: Goatfell project, B.C., drill hole DDH-1, 298 m depth

ROCK TYPE: Meta-siltstone to fine sandstone

HAND SPECIMEN: Thin section offcut chip (0.8 x 2.1 x 3.6 cm) cut perpendicular to compositional layering (bedding), which is defined by light to dark green layers (2-6 mm) with apparent grading. Grain size is very fine (0.1 mm?) with slightly coarser black and dark green spots to 0.25 mm. Mineralization consists of a few grains (up to 0.5 mm) of angular to subhedral, silvery arsenopyrite (<< 1%) and minor disseminated pyrrhotite (not apparently magnetic). Pink areas (up to 7 mm) superimposed across bedding may be garnet; the smaller areas are solid pink, whereas the larger ones show a rim 0.5 mm wide of pink garnet(?) surrounding a grey to greenish-grey core (atoll structure). Very fine calcite veins (react in HCL) crosscut the garnet atolls.

THIN SECTION:

% (Approx.)	MINERALS
60	Quartz - Angular to subrounded, poorly to medium well-sorted silt- to fine sand-sized clastic grains; some undulose extinction; uniaxial(+). Occurs also in larger grains within atoll garnets, where undulose extinction is most common.
10-15	Muscovite/Sericite - Colourless mica, med. biref., may be from altered feldspar and/or detrital mica. One layer has porphyroblastic muscovite as well as abundant sericite, sphene, etc. Clinozoisite vein crosscuts muscovite porphyroblast.
5-10	Biotite - Brown mica, occurs disseminated as small, squarish flakes, concentrated in some layers more than others. Locally altered to chlorite. Associated with sphene.
5	Chlorite - Pale green, an alteration of biotite
3-4	Garnet - Poikilitic to skeletal to atoll-shaped, filled mainly by quartz. Inclusions may be quartz, clinozoisite, minor opaques.
2-3	Sphene - High relief, brownish pleochroism, sphene shape; isolated grains and as common high relief grains, possibly from altered biotite; may include leucoxene(?). Some sphene surrounds opaque grains in a reaction rim.

1 Epidote/Clinozoisite - High relief; common anomalous blue biref., occurs around opaques and in crosscutting veinlets.

2-3 Opaques - Small grains, skeletal grains. Associated with clinozoisite, post-garnet, some altered to sphene (may be ilmenite).

Trace Rutile or Hematite - High relief grain with strong red absorption

1 Carbonate - Isolated large grains and vein alteration near the atoll garnets.

ROCK TEXTURES/STRUCTURES: Bedding is well preserved as variations in composition and texture. Biotite is altered to chlorite. Garnet occurs as porphyroblasts and ring-shapes (atolls). Muscovite occurs as porphyroblasts and as sericitic alteration of feldspar(?). Sphene is concentrated in layer with porphyroblastic muscovite, epidote, sericite, and opaque dust. No deformation textures were noted except for slightly flattened garnets and undulose extinction in quartz.

PROTOLITH: Siltstone, quartz arenite, or greywacke

ALTERATION/MINERALIZATION: Alteration is metamorphic: muscovite - garnet - biotite (lower amphibolite facies?); and retrograde metamorphic: sericite - chlorite - epidote (greenschist facies). Opaques are apparently premetamorphic.

CONDITIONS OF FORMATION: Deposition of quartz - feldspar(?) siltstone or greywacke in turbidite environment. Static metamorphism to lower amphibolite facies or hornblende hornfels facies produced red-brown biotite and garnet (and sphene); retrograde metamorphism resulted in chlorite, sericite, epidote alteration.

PETROGRAPHIC REPORT by J.S. Getsinger, PhD

For: Chevron Minerals Ltd. Date: 88-11
Project: Goatfell - M586 Collector: M.W. Hitzman
Sample: M586-DDH1-1004'(306 m) Date Collected: 1988

LOCATION: Goatfell project, B.C., drill hole DDH-1, 306 m depth

ROCK TYPE: Meta-siltstone to fine sandstone

HAND SPECIMEN: Thin section offcut chip (0.8 x 2.2 x 3.6 cm), cut across layering. About one third of the section is light yellowish-green with thin rip-up clasts (up to 0.1 x 3 mm) of finer-grained yellowish-green shale and patchy yellowish- green alteration that may be sericite. The other part of the section is slightly finer-grained (<0.1 mm), dark grey, with light greenish-grey alteration patches. Only very minor local reaction to HCl. Mineralization is not apparent, although there may be some very finely disseminated sulphides. Non-magnetic.

THIN SECTION:

% (Approx.)	MINERALS
60	Quartz - Moderately well-sorted grains are closely packed with minimal sericitic matrix; uniaxial(+)
5	Feldspar - K-feldspar - Microcline twinning(?), minor - Plagioclase - Albite twinning, relief contrast with quartz
10-15	Muscovite - Colourless mica. Detrital and alteration. Locally occurs with fine-grained, semi-opaque material.
10-15	Biotite - Brown mica, equant small flakes; locally altered to chlorite
3-5	Chlorite - Pale green, from altered biotite; causes local light green colour of rock.
<1	Sphene - High relief, biref. Isolated grains and fine-grained alteration products
<1	Carbonate - Mainly in veinlet
<1	Opaques - Fine-grained, ragged, disseminated; also associated with chlorite

ROCK TEXTURES/STRUCTURES: Rip-up clasts are finer-grained, slightly more argillaceous than rest of siltstone. Sedimentary textures are well preserved; no deformation textures were noted. Chlorite replaces biotite. Mica is somewhat aligned on bedding.

PROTOLITH: Siltstone to fine sandstone

ALTERATION/MINERALIZATION: Alteration is mainly metamorphic - biotite, muscovite; and retrograde metamorphic - sericite, chlorite; with late carbonate veining. Opaques may be primary or products of retrograde metamorphism.

CONDITIONS OF FORMATION: Deposition in turbidite environment. Static metamorphism to upper greenschist facies(?). Retrograde metamorphism caused biotite to alter to chlorite.

PETROGRAPHIC REPORT by J.S. Getsinger, PhD

For: Chevron Minerals Ltd. Date: 88-11
Project: Goatfell - M586 Collector: M.W. Hitzman
Sample: M586-DDH1-1073'(327 m) Date Collected: 1988

LOCATION: Goatfell project, B.C., drill hole DDH-1, 327 m depth

ROCK TYPE: Meta-siltstone to fine sandstone

HAND SPECIMEN: Thin section offcut chip (0.9 x 2.1 x 3.6 cm). Rock is very fine-grained (less than 0.1 mm), hard, siliceous, a dull greenish, tannish grey. Layering is defined by subtle textural changes. Darker grey blebs and patches to 1 cm (chlorite) and very fine, light-coloured veinlets (calcite, react in HCl) crosscut the siltstone. Non-magnetic.

THIN SECTION:

% (Approx.)	MINERALS
60	Quartz - Poorly sorted, angular to subrounded silt-sized grains
15-20	Muscovite - Colourless mica, med. biref., irregularly aligned
5-10	Carbonate - In crosscutting veinlets, probably calcite
1	Tourmaline - Isolated small, euhedral to subhedral grains. Slightly zoned, with O = blue-green to olive to brown, E = tan, O > E.
3-5	Chlorite - Pale green, low biref., with pleochroic haloes; occurs as alteration along fractures
Trace	Zircon - Pleochroic haloes in chlorite
2-3	Opaques - Finely disseminated

ROCK TEXTURES/STRUCTURES: Bedding is not planar but somewhat convoluted or perhaps microfaulted. Crosscutting fractures are filled with carbonate; some are filled with chlorite. Fracturing may indicate minor brittle deformation.

PROTOLITH: Siltstone or quartz arenite

ALTERATION/MINERALIZATION: Tourmaline occurs as individual grains disseminated throughout. Muscovite may indicate low grade metamorphism. Chlorite is a product of alteration or retrograde metamorphism. Calcite is a late vein-type alteration. Mineralization consists of finely disseminated opaques.

CONDITIONS OF FORMATION: Siltstone was deposited in turbidite enviornment. Low-grade metamorphism may be indicated by muscovite, but assemblage is generally undiagnostic. Chlorite is a result of later retrogression or hydrothermal alteration. Calcite came in on veins or microfaults, indicating possible brittle fracturing.

PETROGRAPHIC REPORT by J.S. Getsinger, PhD

For: Chevron Minerals Ltd. Date: 88-11
Project: Goatfell - M586 Collector: M.W. Hitzman
Sample: M586-DDH1-1117'(340 m) Date Collected: 1988

LOCATION: Goatfell project, B.C., drill hole DDH-1, 340 m depth

ROCK TYPE: Meta-siltstone to fine sandstone

HAND SPECIMEN: Thin section offcut chip (0.8 x 2.3 x 3.7 cm). Light greenish-grey, hard siltstone shows sedimentary structures such as graded bedding, local soft-sediment folding, and possible slumping. The coarser grains may be muscovite. Rusty veinlets are both parallel to and crosscutting bedding; some are filled with milky white material; little reaction to HCl.

THIN SECTION:

% (Approx.)	MINERALS
40-45	Quartz - Fine-grained, clastic
5(?)	Plagioclase - Albite-twinned grains in with quartz
40-45	Muscovite - Mainly sericitic, fine-grained, white mica, aligned subparallel to bedding. Some layers are nearly pure mica.
2-3	Sphene - High relief, sphene-shaped, brownish, as alteration of opaques (ilmenite?) and as individual grains and alteration associated with tourmaline-bearing areas.
<1	Tourmaline - Tiny zoned grains, olive to brownish, associated with sphene along a crosscutting trend and within the layering.
1-2	Opaques - Finely disseminated and in clumps
2-3	Carbonate - In veins. Poor reaction to HCl and rusty weathering suggest dolomitic or ankeritic component. Untwinned; extreme relief changes; one index lower than or equal to balsam (indicating some calcite); extreme biref.; uniaxial(-) with colour rings.

ROCK TEXTURES/STRUCTURES: Bedding is somewhat curved, but not visibly cross-laminated. Mica defines bedding-parallel foliation. Tourmaline and sphene are related to a crosscutting trend. Carbonate comes in on veins, some parallel to bedding.

PROTOLITH: Siltstone or quartzofeldspathic arenite with argillaceous layers

ALTERATION/MINERALIZATION: Tourmaline and sphene may have been introduced hydrothermally. Muscovite/sericite indicates some metamorphic recrystallization. Mineralization consists of finely disseminated opaques. Late carbonate veins are probably ankeritic.

CONDITIONS OF FORMATION: Deposition of siltstone in turbiditic environment. Low-grade metamorphic recrystallization. Possible hydrothermal alteration bringing in sphene and tourmaline, possibly opaques. Late carbonate veining.

PETROGRAPHIC REPORT by J.S. Getsinger, PhD

For: Chevron Minerals Ltd. Date: 88-11
Project: Goatfell - M586 Collector: M.W. Hitzman
Sample: M586-DDH1-1139.5'(347 m) Date Collected: 1988

LOCATION: Goatfell project, B.C., drill hole DDH-1, 347 m depth

ROCK TYPE: Hornfelsed siltstone to fine sandstone

HAND SPECIMEN: Thin section offcut chip (0.8 x 2.1 x 3.6 cm). Very fine-grained (<< 0.1 mm), hard, massive siltstone is light greenish-grey with tiny green spots(0.1 mm), and darker grey. The transition is irregular, not following bedding, and appears to crosscut primary textures. One late, crosscutting veinlet reacts in HCl (calcite). Non-magnetic.

THIN SECTION:

% (Approx.)	MINERALS
50-55	Quartz - Well-sorted, interlocking grains.
10-15	Feldspar - Turbid, with relief contrast to quartz, somewhat altered to sericite
15	Muscovite - As porphyroblasts scattered throughout, and pervasive sericite alteration on altered feldspar
10	Chlorite - Pale green flakes, distributed throughout
1-2	Biotite - Pale brown mica, mainly altered to chlorite; bent grains
Trace	Tourmaline - Slightly zoned, olive to brown
2-4	Opaques - Finely disseminated, and altered to semi-opaque masses, possibly sphene
<1	Carbonate - In crosscutting veinlets

ROCK TEXTURES/STRUCTURES: Biotite is altered to pale green chlorite. Texture is clearly clastic but somewhat recrystallized, with no clear foliation or bedding. The colour difference in the rocks is due to more opaques in the dark portion, and chlorite in the light greenish-grey portion.

PROTOLITH: Siltstone or quartzofeldspathic arenite

ALTERATION/MINERALIZATION: Feldspar is altered somewhat to sericite; biotite nearly completely to chlorite. Pale green visible alteration in rock is related to chloritization of biotite. Mineralization consists of finely disseminated opaques. Late carbonate veins crosscut rock.

CONDITIONS OF FORMATION: Deposition of siltstone in turbidite environment. Some metamorphic recrystallization caused growth of biotite, and muscovite porphyroblasts. Retrogression is mainly indicated by chlorite alteration. Opaques may be primary or metamorphic. Carbonate veinlets are late hydrothermal.

PETROGRAPHIC REPORT by J.S. Getsinger, PhD

For: Chevron Minerals Ltd. Date: 88-12
Project: Goatfell - M586 Collector: -
Sample: Sullivan S-1 Date Collected: Pre-1988

LOCATION: Sullivan Chloritized Siltstone, Hanging Wall

ROCK TYPE: Mineralized garnetiferous quartz-biotite siltstone

HAND SPECIMEN: No hand specimen. Section shows squarish patch 1 x 1.5 cm of darker area with scattered, fine-grained opaques and red-brown grains (hematite, 2-3%) forming darker core, in a background of fine-grained, light-coloured rock. Opaques and darker minerals, 5-10%.

THIN SECTION:

% (Approx.) MINERALS

5-10	Opaques - Finely disseminated, with some concentration toward centre of slide, anhedral, skeletal forms, surrounded by garnet and quartz alteration; some alteration to hematite.
2-3	Hematite - High relief, anhedral grains with red absorption, surrounding and intergrown with skeletal opaques.
20-25	Garnet - High relief, light-coloured alteration associated with opaques, blobby to subhedral, isotropic to very low biref.
30-35	Quartz - Occurs as polygonal grains interstitial to mineralization, uniaxial(+) with some albite. Also occurs in siltstone matrix (+_ feldspar) with sericite.
5-10	Biotite - Brown mica associated with opaques
3-4	Chlorite - Low to anomalous blue biref., very pale green, associated with hematite
10	Sericite (Muscovite) - Fine-grained, colourless mica in fine-grained sediment that is not as altered as central part
2-5	Feldspar (Albite?) - With albite twinning, associated with opaques and quartz; may also occur in siltstone part
Trace	Tourmaline - Very tiny, individual greenish grains in siltstone

ROCK TEXTURES/STRUCTURES: Rock is very fine-grained overall, with coarser, recrystallized area in the centre, with opaques, garnet, quartz, biotite, and chlorite, with minor feldspar. Rest of rock is less altered, finer-grained, sericitic quartz (+_ feldspar?) siltstone. Garnet is clearly associated with opaques.

PROTOLITH: Siltstone

ALTERATION/MINERALIZATION: Alteration associated with mineralization is dominantly garnet and quartz, with lesser biotite, chlorite, and feldspar (there is not enough chlorite to justify calling it "chloritized", however). Mineralization may be pyrrhotite, and must include some iron.

CONDITIONS OF FORMATION: Deposition in fine-grained sedimentary environment. Possible metamorphism to upper greenschist facies, postdating or accompanying mineralization. Later retrograde alteration to minor chlorite and hematite.

PETROGRAPHIC REPORT by J.S. Getsinger, PhD

For: Chevron Minerals Ltd. Date: 88-12
Project: Goatfell - M586 Collector: -
Sample: Sullivan S-2 Date Collected: pre-1988

LOCATION: Sullivan Tourmalinite Footwall

ROCK TYPE: Tourmalinized siltstone conglomerate

HAND SPECIMEN: No hand specimen.

THIN SECTION:

% (Approx.) MINERALS

40% Clasts: Angular to subangular, dirty white to olive brown, tabular, up to 2 x 3 mm, with fine laminations, apparently siltstone or shale, altered to brownish, fine-grained material which contains tourmaline(?) needles.

Matrix:

25-30 Quartz - Colourless. Angular silty to sandy grains, some subdivided, recrystallized; some overgrown with tiny needles; uniaxial(+).

3-4 Opaques - Pyrrhotite(?); occurs in lumpy skeletal grains, in matrix.

<1 Iron oxide(?) - High relief, brownish alteration around opaques.

25 Tourmaline(?) - Fine-grained needles forming brownish mat throughout matrix and in clasts; colourless to pale green, length fast.

2 Carbonate - Associated with opaques and muscovite

1-2 Muscovite - Colourless mica, medium biref., associated with opaques. Also occurs in some altered clasts.

ROCK TEXTURES/STRUCTURES: Poorly sorted sediment has grain size from silt(?) to small pebbles of siltstone or shale. Clasts as well as matrix are pervasively altered with tourmaline needles. Quartz is unaltered, shows some recrystallization. Opaques are disseminated skeletal grains in matrix.

PROTOLITH: Sedimentary conglomerate with clasts of siltstone/shale

ALTERATION/MINERALIZATION: Alteration is mainly in form of fine-grained tourmaline(?) needles (up to 25%). Mineralization is associated with muscovite and carbonate.

CONDITIONS OF FORMATION: Deposition in quartz-rich clastic sedimentary environment (turbidite), with conglomerate forming locally from shale and siltstone layers, indicating faulting or slumping. Tourmaline-alteration is post-depositional.

PETROGRAPHIC REPORT by J.S. Getsinger, PhD

For: Chevron Minerals Ltd. Date: 88-12
Project: Goatfell - M586 Collector: -
Sample: Mt. Mahon 2 Date Collected: pre-1988

LOCATION: Goatfell project, B.C.

ROCK TYPE: Tourmalinized(?) siltstone

HAND SPECIMEN: No hand specimen. Slide shows very fine-grained, laminated shale to siltstone, with finer-grained portions a dull olive brown colour. Siltstone shows wavy bedding, possibly intraformational slump-folding.

THIN SECTION:

% (Approx.) MINERALS

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30 Quartz (+_ Feldspar?) - Fine-grained, colourless, low biref., low relief background material

5 Feldspar - Larger grains in coarser (silty) layers, biaxial, poikiloblastic

20-30 Muscovite - Colourless mica flakes; in coarser-grained layers aligned at an angle (40 degrees) to bedding, apparently subparallel with axial planes of minor slump folds.

1 Garnet - Euhedral, individual grains (porphyroblasts) sparsely distributed across the section, occurring particularly in the finer-grained layers (14 grains total, 0.1 to 0.5 mm).

2 Opaques - Very finely disseminated throughout

<1 Tourmaline - Individual prisms in silty layers; O = green, E = colourless to tan, O > E.

20-30 Tourmaline(?) - Fine-grained, med.-high relief, dark-appearing but actually colourless to very pale green needles, in shaly layers; length fast; no pleochroism; forming a dirty-brown looking mat. Clearly a different phase from the larger individual grains of green tourmaline seen scattered throughout the section.

ROCK TEXTURES/STRUCTURES: Grain size varies from very fine (clay?) to fine (silt) in laminations and graded bedding (beds < 1 cm, laminations < 1 mm). Coarser-grained laminations have muscovite aligned at about 40 degrees to bedding, subparallel to axial planes of minor folds.

PROTOLITH: Siltstone/shale (turbidite)

ALTERATION/MINERALIZATION: Metamorphic minerals are garnet and muscovite, possibly feldspar. Alteration includes two possible forms of tourmaline, larger individual green grains, and a brown mat of fine-grained needles. Mineralization consists of very finely disseminated opaques.

CONDITIONS OF FORMATION: Deposition of fine sediment in turbiditic environment. Static metamorphism, possibly accompanied by very weak deformation, to upper greenschist facies (garnet, muscovite). Tourmaline needles are probably hydrothermal, whereas larger grains could be detrital and/or metamorphic.

PETROGRAPHIC REPORT by J.S. Getsinger, PhD

For: Chevron Minerals Ltd. Date: 88-11
Project: Goatfell - M586 Collector: M.W. Hitzman
Sample: M586-DDH1-Bx55 (298 m) Date Collected: 1988

LOCATION: Goatfell project, B.C., drill hole DDH-1, 298 m depth

ROCK TYPE: Meta-siltstone to fine sandstone

HAND SPECIMEN: Thin section offcut chip (0.8 x 2.1 x 3.6 cm) cut perpendicular to compositional layering (bedding), which is defined by light to dark green layers (2-6 mm) with apparent grading. Grain size is very fine (0.1 mm?) with slightly coarser black and dark green spots to 0.25 mm. Mineralization consists of a few grains (up to 0.5 mm) of angular to subhedral, silvery arsenopyrite (<< 1%) and minor disseminated pyrrhotite (not apparently magnetic). Pink areas (up to 7 mm) superimposed across bedding may be garnet; the smaller areas are solid pink, whereas the larger ones show a rim 0.5 mm wide of pink garnet(?) surrounding a grey to greenish-grey core (atoll structure). Very fine calcite veins (react in HCL) crosscut the garnet atolls.

THIN SECTION:

% (Approx.) MINERALS

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60 Quartz - Angular to subrounded, poorly to medium well-sorted silt- to fine sand-sized clastic grains; some undulose extinction; uniaxial(+). Occurs also in larger grains within atoll garnets, where undulose extinction is most common.

10-15 Muscovite/Sericite - Colourless mica, med. biref., may be from altered feldspar and/or detrital mica. One layer has porphyroblastic muscovite as well as abundant sericite, sphene, etc. Clinozoisite vein crosscuts muscovite porphyroblast.

5-10 Biotite - Brown mica, occurs disseminated as small, squarish flakes, concentrated in some layers more than others. Locally altered to chlorite. Associated with sphene.

5 Chlorite - Pale green, an alteration of biotite

3-4 Garnet - Poikilitic to skeletal to atoll-shaped, filled mainly by quartz. Inclusions may be quartz, clinozoisite, minor opaques.

2-3 Sphene - High relief, brownish pleochroism, sphene shape; isolated grains and as common high relief grains, possibly from altered biotite; may include leucoxene(?). Some sphene surrounds opaque grains in a reaction rim.

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1	Epidote/Clinozoisite - High relief; common anomalous blue biref., occurs around opaques and in crosscutting veinlets.
2-3	Opaques - Small grains, skeletal grains. Associated with clinozoisite, post-garnet, some altered to sphene (may be ilmenite).
Trace	Rutile or Hematite - High relief grain with strong red absorption
1	Carbonate - Isolated large grains and vein alteration near the atoll garnets.

ROCK TEXTURES/STRUCTURES: Bedding is well preserved as variations in composition and texture. Biotite is altered to chlorite. Garnet occurs as porphyroblasts and ring-shapes (atolls). Muscovite occurs as porphyroblasts and as sericitic alteration of feldspar(?). Sphene is concentrated in layer with porphyroblastic muscovite, epidote, sericite, and opaque dust. No deformation textures were noted except for slightly flattened garnets and undulose extinction in quartz.

PROTOLITH: Siltstone, quartz arenite, or greywacke

ALTERATION/MINERALIZATION: Alteration is metamorphic: muscovite - garnet - biotite (lower amphibolite facies?); and retrograde metamorphic: sericite - chlorite - epidote (greenschist facies). Opaques are apparently premetamorphic.

CONDITIONS OF FORMATION: Deposition of quartz - feldspar(?) siltstone or greywacke in turbidite environment. Static metamorphism to lower amphibolite facies or hornblende hornfels facies produced red-brown biotite and garnet (and sphene); retrograde metamorphism resulted in chlorite, sericite, epidote alteration.

PETROGRAPHIC REPORT by J.S. Getsinger, PhD

For: Chevron Minerals Ltd. Date: 88-11
Project: Goatfell - M586 Collector: M.W. Hitzman
Sample: M586-DDH1-1004'(306 m) Date Collected: 1988

LOCATION: Goatfell project, B.C., drill hole DDH-1, 306 m depth

ROCK TYPE: Meta-siltstone to fine sandstone

HAND SPECIMEN: Thin section offcut chip (0.8 x 2.2 x 3.6 cm), cut across layering. About one third of the section is light yellowish-green with thin rip-up clasts (up to 0.1 x 3 mm) of finer-grained yellowish-green shale and patchy yellowish- green alteration that may be sericite. The other part of the section is slightly finer-grained (<0.1 mm), dark grey, with light greenish-grey alteration patches. Only very minor local reaction to HCl. Mineralization is not apparent, although there may be some very finely disseminated sulphides. Non-magnetic.

THIN SECTION:

% (Approx.)	MINERALS
60	Quartz - Moderately well-sorted grains are closely packed with minimal sericitic matrix; uniaxial(+)
5	Feldspar - K-feldspar - Microcline twinning(?), minor - Plagioclase - Albite twinning, relief contrast with quartz
10-15	Muscovite - Colourless mica. Detrital and alteration. Locally occurs with fine-grained, semi-opaque material.
10-15	Biotite - Brown mica, equant small flakes; locally altered to chlorite
3-5	Chlorite - Pale green, from altered biotite; causes local light green colour of rock.
<1	Sphene - High relief, biref. Isolated grains and fine-grained alteration products
<1	Carbonate - Mainly in veinlet
<1	Opaques - Fine-grained, ragged, disseminated; also associated with chlorite

ROCK TEXTURES/STRUCTURES: Rip-up clasts are finer-grained, slightly more argillaceous than rest of siltstone. Sedimentary textures are well preserved; no deformation textures were noted. Chlorite replaces biotite. Mica is somewhat aligned on bedding.

PROTOLITH: Siltstone to fine sandstone

ALTERATION/MINERALIZATION: Alteration is mainly metamorphic - biotite, muscovite; and retrograde metamorphic - sericite, chlorite; with late carbonate veining. Opaques may be primary or products of retrograde metamorphism.

CONDITIONS OF FORMATION: Deposition in turbidite environment. Static metamorphism to upper greenschist facies(?). Retrograde metamorphism caused biotite to alter to chlorite.

PETROGRAPHIC REPORT by J.S. Getsinger, PhD

For: Chevron Minerals Ltd. Date: 88-11
Project: Goatfell - M586 Collector: M.W. Hitzman
Sample: M586-DDH1-1073'(327 m) Date Collected: 1988

LOCATION: Goatfell project, B.C., drill hole DDH-1, 327 m depth

ROCK TYPE: Meta-siltstone to fine sandstone

HAND SPECIMEN: Thin section offcut chip (0.9 x 2.1 x 3.6 cm). Rock is very fine-grained (less than 0.1 mm), hard, siliceous, a dull greenish, tannish grey. Layering is defined by subtle textural changes. Darker grey blebs and patches to 1 cm (chlorite) and very fine, light-coloured veinlets (calcite, react in HCl) crosscut the siltstone. Non-magnetic.

THIN SECTION:

% (Approx.)	MINERALS
60	Quartz - Poorly sorted, angular to subrounded silt-sized grains
15-20	Muscovite - Colourless mica, med. biref., irregularly aligned
5-10	Carbonate - In crosscutting veinlets, probably calcite
1	Tourmaline - Isolated small, euhedral to subhedral grains. Slightly zoned, with O = blue-green to olive to brown, E = tan, O > E.
3-5	Chlorite - Pale green, low biref., with pleochroic haloes; occurs as alteration along fractures
Trace	Zircon - Pleochroic haloes in chlorite
2-3	Opaques - Finely disseminated

ROCK TEXTURES/STRUCTURES: Bedding is not planar but somewhat convoluted or perhaps microfaulted. Crosscutting fractures are filled with carbonate; some are filled with chlorite. Fracturing may indicate minor brittle deformation.

PROTOLITH: Siltstone or quartz arenite

ALTERATION/MINERALIZATION: Tourmaline occurs as individual grains disseminated throughout. Muscovite may indicate low grade metamorphism. Chlorite is a product of alteration or retrograde metamorphism. Calcite is a late vein-type alteration. Mineralization consists of finely disseminated opaques.

CONDITIONS OF FORMATION: Siltstone was deposited in turbidite enviornment. Low-grade metamorphism may be indicated by muscovite, but assemblage is generally undiagnostic. Chlorite is a result of later retrogression or hydrothermal alteration. Calcite came in on veins or microfaults, indicating possible brittle fracturing.

PETROGRAPHIC REPORT by J.S. Getsinger, PhD

For: Chevron Minerals Ltd. Date: 88-11
Project: Goatfell - M586 Collector: M.W. Hitzman
Sample: M586-DDH1-1117'(340 m) Date Collected: 1988

LOCATION: Goatfell project, B.C., drill hole DDH-1, 340 m depth

ROCK TYPE: Meta-siltstone to fine sandstone

HAND SPECIMEN: Thin section offcut chip (0.8 x 2.3 x 3.7 cm). Light greenish-grey, hard siltstone shows sedimentary structures such as graded bedding, local soft-sediment folding, and possible slumping. The coarser grains may be muscovite. Rusty veinlets are both parallel to and crosscutting bedding; some are filled with milky white material; little reaction to HCl.

THIN SECTION:

% (Approx.)	MINERALS
40-45	Quartz - Fine-grained, clastic
5(?)	Plagioclase - Albite-twinned grains in with quartz
40-45	Muscovite - Mainly sericitic, fine-grained, white mica, aligned subparallel to bedding. Some layers are nearly pure mica.
2-3	Sphene - High relief, sphene-shaped, brownish, as alteration of opaques (ilmenite?) and as individual grains and alteration associated with tourmaline-bearing areas.
<1	Tourmaline - Tiny zoned grains, olive to brownish, associated with sphene along a crosscutting trend and within the layering.
1-2	Opaques - Finely disseminated and in clumps
2-3	Carbonate - In veins. Poor reaction to HCl and rusty weathering suggest dolomitic or ankeritic component. Untwinned; extreme relief changes; one index lower than or equal to balsam (indicating some calcite); extreme biref.; uniaxial(-) with colour rings.

ROCK TEXTURES/STRUCTURES: Bedding is somewhat curved, but not visibly cross-laminated. Mica defines bedding-parallel foliation. Tourmaline and sphene are related to a crosscutting trend. Carbonate comes in on veins, some parallel to bedding.

PROTOLITH: Siltstone or quartzofeldspathic arenite with argillaceous layers

ALTERATION/MINERALIZATION: Tourmaline and sphene may have been introduced hydrothermally. Muscovite/sericite indicates some metamorphic recrystallization. Mineralization consists of finely disseminated opaques. Late carbonate veins are probably ankeritic.

CONDITIONS OF FORMATION: Deposition of siltstone in turbiditic environment. Low-grade metamorphic recrystallization. Possible hydrothermal alteration bringing in sphene and tourmaline, possibly opaques. Late carbonate veining.

PETROGRAPHIC REPORT by J.S. Getsinger, PhD

For: Chevron Minerals Ltd. Date: 88-11
Project: Goatfell - M586 Collector: M.W. Hitzman
Sample: M586-DDH1-1139.5'(347 m) Date Collected: 1988

LOCATION: Goatfell project, B.C., drill hole DDH-1, 347 m depth

ROCK TYPE: Hornfelsed siltstone to fine sandstone

HAND SPECIMEN: Thin section offcut chip (0.8 x 2.1 x 3.6 cm). Very fine-grained (<< 0.1 mm), hard, massive siltstone is light greenish-grey with tiny green spots(0.1 mm), and darker grey. The transition is irregular, not following bedding, and appears to crosscut primary textures. One late, crosscutting veinlet reacts in HCl (calcite). Non-magnetic.

THIN SECTION:

% (Approx.) MINERALS

50-55 Quartz - Well-sorted, interlocking grains.

10-15 Feldspar - Turbid, with relief contrast to quartz, somewhat altered to sericite

15 Muscovite - As porphyroblasts scattered throughout, and pervasive sericite alteration on altered feldspar

10 Chlorite - Pale green flakes, distributed throughout

1-2 Biotite - Pale brown mica, mainly altered to chlorite; bent grains

Trace Tourmaline - Slightly zoned, olive to brown

2-4 Opaques - Finely disseminated, and altered to semi-opaque masses, possibly sphene

<1 Carbonate - In crosscutting veinlets

ROCK TEXTURES/STRUCTURES: Biotite is altered to pale green chlorite. Texture is clearly clastic but somewhat recrystallized, with no clear foliation or bedding. The colour difference in the rocks is due to more opaques in the dark portion, and chlorite in the light greenish-grey portion.

PROTOLITH: Siltstone or quartzofeldspathic arenite

ALTERATION/MINERALIZATION: Feldspar is altered somewhat to sericite; biotite nearly completely to chlorite. Pale green visible alteration in rock is related to chloritization of biotite. Mineralization consists of finely disseminated opaques. Late carbonate veins crosscut rock.

CONDITIONS OF FORMATION: Deposition of siltstone in turbidite environment. Some metamorphic recrystallization caused growth of biotite, and muscovite porphyroblasts. Retrogression is mainly indicated by chlorite alteration. Opaques may be primary or metamorphic. Carbonate veinlets are late hydrothermal.

PETROGRAPHIC REPORT by J.S. Getsinger, PhD

For: Chevron Minerals Ltd. Date: 88-12
Project: Goatfell - M586 Collector: -
Sample: Sullivan S-1 Date Collected: Pre-1988

LOCATION: Sullivan Chloritized Siltstone, Hanging Wall

ROCK TYPE: Mineralized garnetiferous quartz-biotite siltstone

HAND SPECIMEN: No hand specimen. Section shows squarish patch 1 x 1.5 cm of darker area with scattered, fine-grained opaques and red-brown grains (hematite, 2-3%) forming darker core, in a background of fine-grained, light-coloured rock. Opaques and darker minerals, 5-10%.

THIN SECTION:

% (Approx.) MINERALS

5-10	Opaques - Finely disseminated, with some concentration toward centre of slide, anhedral, skeletal forms, surrounded by garnet and quartz alteration; some alteration to hematite.
2-3	Hematite - High relief, anhedral grains with red absorption, surrounding and intergrown with skeletal opaques.
20-25	Garnet - High relief, light-coloured alteration associated with opaques, blobby to subhedral, isotropic to very low biref.
30-35	Quartz - Occurs as polygonal grains interstitial to mineralization, uniaxial(+) with some albite. Also occurs in siltstone matrix (+_ feldspar) with sericite.
5-10	Biotite - Brown mica associated with opaques
3-4	Chlorite - Low to anomalous blue biref., very pale green, associated with hematite
10	Sericite (Muscovite) - Fine-grained, colourless mica in fine-grained sediment that is not as altered as central part
2-5	Feldspar (Albite?) - With albite twinning, associated with opaques and quartz; may also occur in siltstone part
Trace	Tourmaline - Very tiny, individual greenish grains in siltstone

ROCK TEXTURES/STRUCTURES: Rock is very fine-grained overall, with coarser, recrystallized area in the centre, with opaques, garnet, quartz, biotite, and chlorite, with minor feldspar. Rest of rock is less altered, finer-grained, sericitic quartz (+_ feldspar?) siltstone. Garnet is clearly associated with opaques.

PROTOLITH: Siltstone

ALTERATION/MINERALIZATION: Alteration associated with mineralization is dominantly garnet and quartz, with lesser biotite, chlorite, and feldspar (there is not enough chlorite to justify calling it "chloritized", however). Mineralization may be pyrrhotite, and must include some iron.

CONDITIONS OF FORMATION: Deposition in fine-grained sedimentary environment. Possible metamorphism to upper greenschist facies, postdating or accompanying mineralization. Later retrograde alteration to minor chlorite and hematite.

PETROGRAPHIC REPORT by J.S. Getsinger, PhD

For: Chevron Minerals Ltd. Date: 88-12
Project: Goatfell - M586 Collector: -
Sample: Sullivan S-2 Date Collected: pre-1988

LOCATION: Sullivan Tourmalinite Footwall

ROCK TYPE: Tourmalinized siltstone conglomerate

HAND SPECIMEN: No hand specimen.

THIN SECTION:

% (Approx.) MINERALS

40% Clasts: Angular to subangular, dirty white to olive brown, tabular, up to 2 x 3 mm, with fine laminations, apparently siltstone or shale, altered to brownish, fine-grained material which contains tourmaline(?) needles.

Matrix:

25-30 Quartz - Colourless. Angular silty to sandy grains, some subdivided, recrystallized; some overgrown with tiny needles; uniaxial(+).

3-4 Opaques - Pyrrhotite(?); occurs in lumpy skeletal grains, in matrix.

<1 Iron oxide(?) - High relief, brownish alteration around opaques.

25 Tourmaline(?) - Fine-grained needles forming brownish mat throughout matrix and in clasts; colourless to pale green, length fast.

2 Carbonate - Associated with opaques and muscovite

1-2 Muscovite - Colourless mica, medium biref., associated with opaques. Also occurs in some altered clasts.

ROCK TEXTURES/STRUCTURES: Poorly sorted sediment has grain size from silt(?) to small pebbles of siltstone or shale. Clasts as well as matrix are pervasively altered with tourmaline needles. Quartz is unaltered, shows some recrystallization. Opaques are disseminated skeletal grains in matrix.

PROTOLITH: Sedimentary conglomerate with clasts of siltstone/shale

ALTERATION/MINERALIZATION: Alteration is mainly in form of fine-grained tourmaline(?) needles (up to 25%). Mineralization is associated with muscovite and carbonate.

CONDITIONS OF FORMATION: Deposition in quartz-rich clastic sedimentary environment (turbidite), with conglomerate forming locally from shale and siltstone layers, indicating faulting or slumping. Tourmaline-alteration is post-depositional.

PETROGRAPHIC REPORT by J.S. Getsinger, PhD

For: Chevron Minerals Ltd.
Project: Goatfell - M586
Sample: Mt. Mahon 2

Date: 88-12
Collector: -
Date Collected: pre-1988

LOCATION: Goatfell project, B.C.

ROCK TYPE: Tourmalinized(?) siltstone

HAND SPECIMEN: No hand specimen. Slide shows very fine-grained, laminated shale to siltstone, with finer-grained portions a dull olive brown colour. Siltstone shows wavy bedding, possibly intraformational slump-folding.

THIN SECTION:

% (Approx.)	MINERALS
30	Quartz (+_ Feldspar?) - Fine-grained, colourless, low biref., low relief background material
5	Feldspar - Larger grains in coarser (silty) layers, biaxial, poikiloblastic
20-30	Muscovite - Colourless mica flakes; in coarser-grained layers aligned at an angle (40 degrees) to bedding, apparently subparallel with axial planes of minor slump folds.
1	Garnet - Euhedral, individual grains (porphyroblasts) sparsely distributed across the section, occurring particularly in the finer-grained layers (14 grains total, 0.1 to 0.5 mm).
2	Opaques - Very finely disseminated throughout
<1	Tourmaline - Individual prisms in silty layers; O = green, E = colourless to tan, O > E.
20-30	Tourmaline(?) - Fine-grained, med.-high relief, dark-appearing but actually colourless to very pale green needles, in shaly layers; length fast; no pleochroism; forming a dirty-brown looking mat. Clearly a different phase from the larger individual grains of green tourmaline seen scattered throughout the section.

ROCK TEXTURES/STRUCTURES: Grain size varies from very fine (clay?) to fine (silt) in laminations and graded bedding (beds < 1 cm, laminations < 1 mm). Coarser-grained laminations have muscovite aligned at about 40 degrees to bedding, subparallel to axial planes of minor folds.

PROTOLITH: Siltstone/shale (turbidite)

ALTERATION/MINERALIZATION: Metamorphic minerals are garnet and muscovite, possibly feldspar. Alteration includes two possible forms of tourmaline, larger individual green grains, and a brown mat of fine-grained needles. Mineralization consists of very finely disseminated opaques.

CONDITIONS OF FORMATION: Deposition of fine sediment in turbiditic environment. Static metamorphism, possibly accompanied by very weak deformation, to upper greenschist facies (garnet, muscovite). Tourmaline needles are probably hydrothermal, whereas larger grains could be detrital and/or metamorphic.