

Comments on hand specimens in the mine office.

Some of the specimens have euhedral molybdenite crystals disseminated in feldspar biotite pegmatite. Other samples are highly altered to a white chalky material probably clay (kaolinite) and molybdenite occurs both disseminated in the altered material and as pockets along distinct zones in the altered rock. Some specimens have molybdenite and pyrite along fracture zones but disseminated outward from the fracture as well. The country rock and the latter case is leucocratic, probably ~~aplite~~ ^{aplite and} pale green overall. Sulphides are also disseminated in the ~~ap~~l^{ite} which seems to be relatively fresh. In another sample, the pegmatite ~~with~~ ^{has} greenish feldspar crystals up to 1/2 inch and more across which lie in a coarse-grained calcite matrix ~~is~~ ^{with} abundant disseminated molybdenite (estimated at 4 or 5 % MoS₂) and lesser pyrite is in sharp contact with the aplitic rock which is very sparsely mineralized in this case. [~~Particularly the whole batholith and as well a topographic 1/2 mile compilation map that Ron made which also has the geology roughed in. I'm going to try and get a copy. The distribution of volcanic rocks on their claims and over at Alwin is very intriguing. In one spot they have a diamond drill hole 304 feet deep. Strictly in volcanics and within a few hundred yards of the Bethsaida contact. Possibly there is a stream valley filled with volcanic debris - pyroclastics and such cutting down through from the Comineo ground over to Alwin.~~]

~~Correction~~ Hole AR11 of Comineo had 904 feet of volcanics. A second hole nearby, 100 feet or so from the Bethsaida contact had 300 feet and bottomed in volcanics and was a churn drill hole. AR11 was a diamond drill hole.] Back to Mount Copeland Mines

On the tour today, we were taken in by Bill ~~Fathergill~~^{Fathergill?} along the 6150 level to the hoist area and hoisted up to 6550 level. From ~~there~~^{there} we climbed up to the 6,600-foot level and visited several draw points, wandered ~~along~~^{or} through a number of stopes, finally ended up going out to the end of the 6600 level. Subsequently we came back down to the 6550 level and had a look at the area which he thinks will flood. This sounds very brief but about then we'd been underground^{for} about 4 hours. Somewhere along the line we ended up on the 6670 level, I'm not quite sure when and managed to get out the vent drive and have a look at the ~~whole~~^{old} camp from which they drove the north portal. In ~~the~~^{the} 6600 level ~~the~~^{we went along} east ~~drive~~^{drive} which is the area ~~where~~^{where} present exploration is being conducted. They've driven out underneath the glacier going eastward. The ore zone is subcommercial at their present milling rate-that is -it is running about .6 ~~Mo~~ and on the average the zone seems to be about 30 feet wide, although this is not certain down near the present heading. No ~~tonnage~~^{tonnage} figure is available for this zone but it could be more than a hundred say more than a hundred thousand tons. To date almost every bit of the product^{ion}~~iveness~~ has come out of the glacier zone. They've mined about 180,000 tons and the mill ~~high~~^{head} grade for that has been around at approximately .85 Mo with a cut off of .7. Note this is Mo not MoS₂.

Thursday, May 24

Cloudy and sort of foggy up here at Mount Copeland Mines. I'll be going underground -going from the 6150 to the 6550 level and then to a draw point of 6600 to get some samples, then out to look at decline E on 6550, then the 200 drive east on 6600. Al ~~Karron~~^{Caron}, the engineer is making me a series of copies of plans and sections and I don't think there is any point spending time doing any

more mapping than the two areas that I just mentioned.

I caught a ride in with the ore train and went up the hoist to the 6550 level. I am now at the end of E ~~(drift E)~~ crosscut ~~_____~~ on the 6550 level. Country rock here is medium grained biotite - syenite - gneiss with occasional large feldspar crystals up to 1/2" across. There is a distinct gneissic banding in the rock. It looks very fresh. The dip of the gneiss foliation varies somewhat but it is -oh, I'd say wavers around vertical. There are some low angle rusty fractures with ~~•~~ subhorizontal slickensides. There are a few biotite-feldspar pegmatite pods, little stringers in effect in the northeastern tip at the end of the crosscut but didn't see any mineralization associated with them. Some of the syenite has quite a pink cast whether it be just K-feldspar or whether it's an alteration phenomenon, I'm not sure.

Sample ~~6552~~ ^{6550-2.}

I took a sample also of the gneiss at the end of the adit of the crosscut and that was ~~6551~~ ⁶⁵⁵⁰⁻¹. The pegmatite stringers continue, ~~_____~~ - in fact increase, as you go along the drift. They're very common in the northern wall. They have biotite both as large ~~blocks~~ ^{blocks} and ~~concentrations~~ ^{concentrations} around them apparently. They have large greenish feldspar crystals and a coarse-grained feldspar-rich matrix. The pegmatite stringers are also exposed on the back ~~and~~ ^{also} on the back ~~are~~ ^{are} ~~outlined~~ complicated folds which are outlined by the gneissic layering in the syenites. This is particularly well-exposed in one section of the back which is lower than the average. There is a fair bit of variation in the cross strike in the syenites. There are biotite rich layers - well in fact - mafic rich layers and leucocratic layers. The fold that I described from the back looks as if it has a phase ~~fold~~ ^{one} nose which is deformed by an anticlinal phase two fold. The relationship of the pegmatite ~~to~~ ^{to} folding isn't

Photo

definite from what I can see, although it could conceivably be cross cutting it. I took two photographs of the fold using the flash and trying to compensate for the weakened condition of the electronic flash by using ASA 25 settings. A little further along the pegmatite ~~is~~ widens ~~out~~^s out. It is now a pale greenish gray colour - at least in the lights of the lamp. It has similar texture to what I mentioned before but some of the larger plagioclase crystals are now several inches across. There are nodes of magnetite-ilmenite. Large biotite phenocrysts ~~are~~^{and} inclusions of finer darker material ^{occur} in the pegmatite and we finally start to see some molybdenite and pyrite mineralization. Molybdenite occurs disseminated in the pegmatite which is locally finer and would have to be called ~~aplite~~^{aplite}. The aplite and pegmatite zones occur quite close together but cause and effect ~~relationships~~ are not clear. In some places it looks as if the pegmatitic phase has inclusions of the aplitic phase. Mineralization also extends out into the country rock. ~~Now~~^S some of the molybdenite and other sulphide mineralization is aligned along zones not really fractures but just spotted along distinct zones. ~~and~~^{In} some of the country rock - the matrix of the rock is simply flooded with sulphides. I took three samples, all of which are labelled E 3 at just immediately west of the draw point - the first draw point. There is so much dust in here from blasting I can't see a damned thing so I'm stopping for lunch. ^(after lunch) It's too smokey ^{still} to work in 6550 so after lunch I've come up to the end of the 200 drive ~~on~~^{on} 6600 level. Right at the end there is a small veinlet which is probably carbonate with sphalerite in it. The drift itself has pegmatite with pods of mineralization, pods of biotite, a lot of pyrite, pyrrhotite and it's in the back, mainly. Kaolinite alteration is pretty abundant here at the ~~base~~^{face}. The sample I've taken has a lot of molybdenite disseminated through it, has large feldspar crystals, some pyrite and perhaps some pyrrhotite.

(200-1)

Sample 6600-200-1

The finer grained rock ^{at} ~~with the phase~~ ^{face} is also mineralized more prominently with pyrrhotite/pyrite than anything else but its finer-grained but its leucocratic and it's probably their aplite - sample no. 6600-200-drive-2. Where the mineralization occurs the rock is literally flooded with sulphide but at least in part, distribution of minerals is fracture controlled. Also at least in part, it is disseminated. The white ~~feldspar~~ ^{feldspar -} rich pegmatite pods occur in aplite in this instance in many cases but locally the aplite itself is very highly mineralized over a couple of feet.

In sample 6600-200-3 the feldspar ~~has~~ an attractive emerald green alteration. The sample is opposite ~~survey~~ ^{survey} station 81.

Sample 200-4 is probably country rock, which is apparently syenite of some description, but rather gray-looking underground. The thing ~~that~~ ^{it} literally shot through with pods of pegmatoid material, ~~was~~ ^{it} on the back and on the walls. Mineralization is not too impressive here but there certainly are sulphides around. This sample is from a little cut approximately 20 feet down the drift from station 81. The south slash near survey station 79 has a rather ~~leucocratic~~ ^{mafic} syenite gneiss which is altered to a pink material along fractures which form rhombic ~~metacrystals~~ ^{metacrystals}. Pegmatite is present as small pods and as undulating variable-width layers within the syenite gneiss. ~~and~~ ^{it} is virtually conformable with the gneiss.

Sample 6600-200-5

The main fault, as they call it, is lagged and it has very soft greenish probably kaolinite gouge in it. Beyond the kaolinite and the main fault, the rock is syenite with pegmatite pods. ~~and~~ ^{the} the pegmatite pods are quite well mineralized and have scattered feldspar crystals up to 3 inches across. The molybdenite is

fairly frequently concentrated around the edges of the big phenocrysts as well as being disseminated through the pegmatite. The syenitic country rock has quite a lot of pyrrhotite and pyrite in it and some scattering of molybdenite but not very much. As before the pegmatite parts do cross cut the foliation but in the main they're elongated in it and look like ~~swabts~~^{swabts}. At survey station 82 the country rock again is syenite with feldspar pegmatite stringers. I see some pyrite scattered around in fractures and some carbonate? veinlets but not very much real mineralization. There are some rusty zones in here which are associated with small fractures and small faults. This station is at the 250-foot-wall raise. Occasionally as before the pegmatite has large pods of coarse-grained biotite. Quite spectacular looking. There is also pyrrhotite in some of the pods and pyrite. Again here the syenite is altered pink and has pink alterations along cracks which cut across the foliation. I'm just about at survey station 72.

Correction: I've ~~passed~~^{passed} survey station 72, I'm now almost at the 350-foot wall slash. This virtually brings me to the end of my detailed 20 scale map and I think I'll ~~(virtually)~~ just head back ~~down~~^{to} 6550 level and decline E now.

First I've taken sample ~~7~~^{No. 7} from the 350-foot wall slash. I'm back in the ~~cut drive again in the~~ 6550 level-east crosscut ~~that is~~, and I've taken a sample at between survey stations 25 and 26 of ~~a~~^a biotite-rich ~~rock~~^{rock} almost a schist but call it a gneiss which may be ~~a~~^a syenitic composition. This is literally shot-through with pegmatite stringers and pods - some of which are mineralized. According to the shift boss the area ahead of me that is stoped out had better than 1 per cent ore and they took something like 10,000 tons out. ~~and~~^{and} the ore seemed to bottom out and it may ~~AA~~^{have been} in one of these fold cores. At least he thinks so but I'm not sure that Bill Fathergill does. That is, the ore may have a keel and they may have mined out the base of the

keel. ^{There} ~~and~~ there may be more potential ~~ore~~ ore above. Certainly in the roof
(~~opposite survey station~~) say 20 feet the other side of survey station 25, ^t there
is about 3 feet of 1 per cent ore in the roof. Mind you this is too narrow to mine
in spite of the grade. Again here there are large greenish feldspar crystals up to
a couple of inches across and these have iron sulphide and molybdenite concentrated
around their borders quite frequently. I've got a sample that shows some of these
big crystals which I have called 6550-E-5. I took a sample just at the end of the
~~stopped~~ ^{stopped} area just before the ^{narrow} ~~road~~ part of the crosscut which is also the incline. It
shows the country rock/pegmatite contact. ^{6550E-6.} This is the end of the Mount Copeland
section.

1973 Field Season

Mt Copeland
Rey Lake property - Avarco
Nicola Cu Mines property -
3 miles East of Logan Lake

MOUNT COPELAND

Comments on Hand Specimens in the Mine Offices

Some of the specimens have euhedral molybdenite crystals disseminated in feldspar biotite pegmatite, other samples are highly altered to a white chalky material probably clay. Kaolinite and molybdenite occur both disseminated in the altered material and as pockets along distinct zones in the altered rock. Some specimens have molybdenite and pyrite along fracture zones ^{and} ~~but~~ disseminated outward from the fractures. The country rock in the latter case is leucocratic probably aplite, pale green overall. Sulphides are also disseminated in the aplite which seems to be relatively fresh. In another sample the pegmatite with greenish feldspar crystals up to half inch or more across ~~which~~ lie in a ^{coarse} ~~course~~ grained ^{calcite} ~~matrix~~ ^{which} has abundant disseminated molybdenite (estimate 45% MOS_2) and lesser pyrite, is in sharp contact with the aplitic rock which is very sparsely mineralized in this case, ~~particularly the whole batholith and as well a topographic half mile compilation map that Ron made which also has their geology roughed in.~~

I'm going to try and get a copy. The distribution of volcanic rocks on their claims and over at Alwin is very intriguing. In one spare spot they have diamond drill hole 304' deep strictly in volcanics and within a few hundred yards of the Bethsaida contact. Possibly there is a stream valley filled with volcanic debris, pyroclastics and such. Cutting down through from the Cominco ground over to Alwin. Correction Hole ARL 1 of Cominco had 904' of volcanics a second hole nearby 100' or so from the Bethsaida contact had 300' and bottomed in volcanics and was a churn drill hole. ARL 1 was a diamond drill hole. Back to Mount Copeland Mines. On the tour today we were taken in by Bill Fothergil along the 6150 level to the host area and ^{were} ~~were~~ hoisted to ^{the} 6550 level. From there we climbed up to the 6600' level and visited several draw points,

Valley
Copper

wandered on through a number of ^{Stops and} ~~stages~~, finally ended up going to the end of the 6600 level. Subsequently we came back down to the 6550 level and had a look at the area which he thinks will flood. This sounds very brief but about then we had been underground for ^{nearly} ~~about~~ 4 hours. Somewhere along the line we ended up on the 6670 level, I'm not quite sure when and managed to get out the vent drive and have a look at the ^{old} ~~whole~~ camp, from which they drove the north ^{portal.} ~~portal.~~ In 6600 level the east one drive ~~which~~ is the area ^{where} of present exploration is being conducted. They've driven out underneath the glacier eastward, the ore zone is sub-commercial at their present milling rate, that is, it's running about .6 ^{% Mo} ~~cut (26%)~~ and on the average the zone seems to be about 30' wide although this ~~is not always true~~ is not certain down near the present heading. No tonnage figures available for this zone but it could be more than 100,000 tons. To date almost every bit of the production has come out of the glacier zone. They have mined about 180,000 tons and the mill head grade for that has been around approximately .85 Mo with a cutoff of .7. Thursday May 24,

cloudy and sort of foggy up here at Mount Copeland Mines. I will be going underground, going from the 6150 level to the 6550 level thence to a draw point of 6600 to get some sample then out to look at ^{the draw points} on 6550, then the 200 drive east on 6600. Al Carron the engineer is making me a series of copies of plans and sections and I don't think there is any point to spending time doing any more mapping than the two ^{bits} I just mentioned. I caught a ride with with work train and went up the hoist to the 6550 level and I'm now at the end of the E drift, E cross cut in fact on the 6550 level. Country rock here is medium grained biotite syenite gneiss with occasional ^{large feldspar} ~~large feldspar~~ crystals up to half an ^{inch} ~~inch~~ across. There is a distinct gneissic banding in the rock, it looks very fresh. The dip on the gneiss foliation varies somewhat but its, oh, I'd say it wavers around vertical. There are some low angle rusty fractures with the sub-horizontal ^{clinkersides.} ~~clinkersides.~~ There are a few biotite, feldspar, pegmatite pods, little stringers in effect, ⁱⁿ ~~the~~ the northeastern

all prod'n from Glacier zone

□ samples

-3-

tip at the end of the cross cut but didn't see any mineralization associated with them. Some of the syenites have quite a pink cast whether it be just K-feldspar ^{feldspar} ~~feldspar~~ or whether its an alteration phenomenon, I'm not sure. Samples 6550 E2. I took a sample also of the gneiss at the end of the adit of the cross cut and that was 6550 EL. The pegmatite stringers continue, ~~to be~~ in fact increase, as you go along the drift. They are very common in the northern wall. They have biotite both as large ^{books} ~~books~~ and as concentrations around them, apparently, and they have large greenish feldspar crystals in a ^{coarse} ~~course~~ grained feldspar-rich matrix. The pegmatite stringers are also exposed on ^{the} back. ~~and~~ ^{also} on the back ~~is outlined of~~ complicated ^{faults} ~~faults which~~ are outlined by the gneissic layering in the syenites. This is particularly well exposed in one section of the back which is lower than the average.

Photos → There is a fair bit of variation across strike in the syenites, there are biotite rich layers ~~and~~ (in fact mafic-rich layers) and leucocratic layers. The fold that I described from the back looks as if its a phase 1 ^{fold} ~~fault~~ nose which is deformed by an anticlinal phase 2 ^{fold} ~~fault~~. The relationship of the pegmatite to ^{folding} ~~faulting~~ isn't definite from what I can see although it could conceivably be cross-cutting it. I took photographs of the ^{fold} ~~fault~~ using the flash and trying to compensate for the weakened condition of the electronic flash by using ASA 25 settings. A little further along the pegmatite is widened out, it's now a pale greenish-grey colour at least in the light of the lamp. It has similar texture to what I mentioned before but some of the larger plagioclase crystals are now several inches across. There are nodes of magnetite illmenite, large biotite phenocrysts or inclusions of finer darker material in the pegmatite and we finally start to see some molybdenite and pyrite mineralization. Molybdenite occurs disseminated in the pegmatite which is locally finer and would have to be called aplite. The aplite and pegmatite zones occur quite close together but cause and effect relationships are not clear. In some places it looks as if the pegmatitic phase has inclusions of the aplitic phase.

....4

Mineralization also extends out into the country rock. Now some of the molybdenite and other sulphide mineralization is ^{aligned} ~~aligned~~ along zones, not really fractures but just spotted along distinct zones. In some of the country rock the matrix of the rock is simply flooded with sulphides. I took three samples all of which are labeled

6550-E3 at just immediately west of the draw point the first draw point. There is so much dust in here from blasting I can't see a ~~damn~~ ^{damn} thing so I'm stopping for lunch. Its too smokey to work in 6550 so after lunch I've come up to the end of the 200 drive or 6600 level. Right at the end is a small veinlet which is probably carbonate with

Sample sphalerite in it. The drift itself has pegmatite with pods of mineralization, pods of biotite, ^{a lot} ~~lot~~ of pyrite, pyrrhotite, ^{The pegmatite is} ~~and its~~ in the back mainly. Kaolinite alteration is abundant here at the base. The sample I've taken has a lot of molybdenite

disseminated through it, has large feldspar crystals, some pyrite and perhaps some pyrrhotite, sample 6600-200-1. The fine grained rock at the face is also mineralized more prominently with pyrrhotite-pyrite than anything else, but its fine grained, ~~but its~~ leucocratic, and ~~the~~ probably aplite sample no. 6600-200-drive-2. Where the

mineralization occurs the rock is literally flooded with sulphide but at least in part ~~the~~ ^{the} distribution of minerals is fracture controlled, also at least in part its disseminated. The white feldspar-rich pegmatite pods occur in aplite in this instance.

In many cases but locally the aplite itself is very highly mineralized over a couple of feet. In sample 6600-200-3 the ^{feldspar} ~~feldspar~~ has an attractive emerald green alteration.

The sample is opposite survey station 81. Sample 200-4 is probably country rock which is apparently syenite of some description but rather grey looking underground. The thing is literally shot through with pods ^{of} pegmatoid material both on the back and on the walls. Mineralization is not too impressive here but there are certainly

sulphides around. This sample is from a little cut approximately 20' down the drift from station 81. The south slash near survey station 79 ^{is} has a rather mafic syenite gneiss which is altered to a pink material along fractures which form rhombic networks. Pegmatite is present as small pods and as ^{undulating} ~~undulating~~ variable - ^{width} ~~with~~ layers within the syenite gneiss and it's virtually conformable with the gneiss.

Sample 6600-200-5. The main fault as they call it is ^{timbered} ~~logged~~ and it has very soft greenish probably kaolinite gouge in it. Beyond the kaolinite and the ^{main} ~~vein~~ fault the rock is syenite with pegmatite pods, ~~and~~ the pegmatite pods are quite well mineralized and have scattered feldspar crystals up to 3 inches across. The molybdenite is fairly frequently concentrated around the edges of the big phenocrysts as well as being disseminated through the pegmatite. The (~~syenite~~) syenetic country

rock has quite a lot of pyrrhotite and pyrite in it and some scattering of molybdenite but not very much. As before, the pegmatite pods do cross cut the foliation but in the ^{are} main ~~are~~ elongated in it and look like ^{sweats.} ~~swats.~~ At survey station 82 the country rock

6600-200-6 again is syenite with feldspar pegmatite stringers. I see some pyrite scattered around in fractures, some carbonate? veinlets but not very much real mineralization. There are some rusty zones in here which are associated with small fractures and small faults. This station is at the 250 foot wall raise. Occasionally as before the pegmatite has large pods of ^{coarse-} ~~course~~ grained biotite, quite spectacular looking. There is also pyrrhotite ^{and pyrite} in some of the pods, ~~and pyrite.~~ Again here, the syenite is altered pink and has pink alteration ~~in~~ along cracks which cut across the foliation.

~~(I'm just about at survey station 72. Correction)~~ I'm past survey station 72, ~~(I'm now)~~ almost at the 350 foot wall slash. This virtually brings me to the end of my detailed 20 scale map and I think I'll ~~virtually~~ head back for ~~(5)~~ 6550 level and decline E now.

First I've taken sample no. 7 from the 350 footwall slash ^{Now} I'm back in the east drive again on 6550 level east crosscut, ^{that is} ~~that is~~, and I've taken a sample at between survey stations 25 and 26 of biotite rich almost a schist we'll call it a gneiss which may be a syenetic composition. This is literally shot through with pegmatite stringers and pods some of which are mineralized. According to the shift boss, the area ahead of me that's ~~staked~~ ^{staged} out had better than 1% ore and they took something like 10,000 tons out, ~~and~~ ^{The} ore seemed to bottom out and it may be in one of these fold cores, at least he thinks so, although I'm not sure Bill Fothergil does. That is the ore may have a keel and they may have mined out the base of the keel and there may potentially be more above. Certainly ~~in the reef opposite survey station~~ ~~say~~ 20 feet the other side of survey station 25, there is about 3 feet of 1% ore in the ~~back.~~ ~~roof.~~ Mind you, this is too narrow to mine in spite of the grade. Now again here there are large greenish feldspar crystals up to a couple of inches across and these ^{frequently} have iron sulphide and molybdenite concentrated around there borders, ~~quite frequently.~~

I've got a sample that shows some of these big crystals which I have called 6550 E 5.

I took a sample just at the end of the ^{staged} area just before the narrow part of the cross cut which is also the incline. It shows the country rock/pegmatite contact.

This is the end of the Mount Copeland section.