General remarks concerning the geology along Yukon-river between Dawson and Fortymile-river and the geology of the Clinton Creek area Y.T.

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I. Reconnaissance along Yukon-river between Dawson and Fortymile-river.

The rocks along Yukon-river, between Dawson and Fortymile-river, present a series of tightly folded, low-grade metamorphic micaschists, feldspatic micaschists, gneisses (?), limestones, slates and quartzites, with a few intercalations of greenstones, serpentine and volcanics. Nearly all these rocks belong to the "greenschists-facies" of regional metamorphism indicated by the abundance of chlorite in all micaschists; only along the last few miles of this river-stretch a somewhat higher metamorphic grade seems to be indicated by the presence of biotite-rich micaschists and gneisses.

a. micaschists.

The micaschists are nearly all chlorite-schists and chlorite-biotite-schists; in some places however the only mica-component is biotite, resulting in biotite-schists. Several times intercalations of very finegrained black schists (or slates) have been found which are distinctly talc-bearing (talc-schists); talc occurs in thin layers (fraction of an inch thick) but also in lenses with a thickness up to 2 or 3 feet. When talc is present, the schists are often pyrite-bearing too. In some places lenses of carbonate-material are intercalated. Nearly always the schists are very rich in quartz in the form of crosscutting and semi-conformable veins or irregular bodies and in the form of conformable lenses, "knauern", "augen" and tiny layers.

All gradations between real greenschists and very biotite-rich micaschists may be found. Usually the micaschists are alternating with series of gneisses, but sometimes they occur also as smaller lenses in the gneisses. The transitions from micaschists to gneis are very gradual and often it is extremely difficult to say if the rock has still to be called: schist or has to be named: gneiss.

Ptychmatic folding is a very common feature in these incompetent rocks; usually the quartz-lenses and "augen" join in these detail-tectonics, but occasionally a distinct "boudinage" may be observed in the more bulky quartz-bodies.

b. gneisses.

Together with the micaschists these rocks form the major part of the exposed series. All gradations from light-coloured chlorite gneisses to very dark biotite-gneisses are present. As the micaschists these rocks are usually very rich in quartz ("knauern", "augen", lenses, veins, stringers and irregular bodies) and, especially in the biotite-rich members, they often contain huge lenses and irregular bodies of light coloured aplitic material. In general the gneisses are finely grained and present a very fine layering, but occasionally a much coarser grain and quite coarse layering may be found.

Ptychmatic folding is much less in these pretty competent rocks; if present there is usually a distinct "boudinage" in the more quartz-rich layers.

In general the quantity of feldspar seems to be inferior to the quantity of quartz present, even so that sometimes it is difficult to determine with the naked eye if the rock is still a gneiss or belongs already to the realm of the quartzites.

c. quartzites.

Quartzites occur as intercalations both in micaschists and gneisses, but predominantly in the dark biotite-rich gneiss series. Nearly always the rock is quite impure and contains considerable quantities of mica: mica-quartzites. The transition from gneiss to mica-quartzite is very gradual.

d. limestones.

As the quartzites, the limestones in this series are generally impure. Most of the limestone occurs as intercalation in micaschists in the form of whitish, green or nearly black, often dolomitic , rock. Sometimes the limestones possess a very pronounced slaty cleavage and containes veinlets and pockets filled with calcite. In places the limestones present a distinct layering caused by thin intercalations of mica.

Halfway between Dawson and Cassiar (Caley-) Creek limestones are present which form a really

important part of the rockseries. It is a very peculiar, probably brechoid, limestone, very "igneous looking" (porphyry) with "phenocrysts" of calcite and lenslike inclusions of "conglomerate" made up of quartz-, quartzite- and slaty pebbles up to 2 inches diameter. Carbonate-rock also occurs in the neighbourhood of serpentine and talc bodies; in these cases it is either a marble-like, quite pure, limestone alternating with very calcareous slates (Woodchopper Creek) or a very rusty weathering carbonate rock very intensively "stained" by blue-green mariposite (Silver City, Cassiar Creek, Fortymile-river, Clinton Creek). This mariposite-carbonate rock is probably a very good indication of serpentine or talc!

e. slates.
Slates are quite rare in this rock series and are either calcareous, very "micaschist-looking" or black slates, which are often associated with the talc-bearing micaschists.

f. greenstones.
Greenstones can be found occasionnaly as intercalations in the micaschists-gneiss series, especially in the very chlorite-rich members. Generally a certain layering may be seen.

g. volcanics.
In one place, about 4 - 5 miles north of Dawson, an intercalation of volcanics has been found It is either a very deeply weathered gabbroic rock or, and more probably so, a basic tuff which contains small phenocrysts of hornblende or pyroxene.

h. dyke rocks.
Along the full length of this river-stretch the rocks mentioned above are cut by dykes of fine-grained dark basic material, probably of gabbroic composition. In some places, especially in the dark biotite-gneisses and micaschists, lightcoloured dykerocks can be found, probably of aplitic material. In general these dykes are from 1 to several feet wide.

i. serpentine.
Serpentine occurs in several places in the area bordering the Yukon-river between Dawson and Fortymile-river (Woodchopper Creek, halfway between Siver City and Cassiar-Caley Creek, south of the junction Yukon-Fortymile rivers, Clinton Creek). The occurences of Cassiar Creek and Woodchopper Creek are well-known and do not need further description here. Of particular interest is the serpentine-occurence found 2 miles south of the mouth of Fortymile-river (Rose Mineral Claims, locationline E, M. Fuher, May 13 1957). It is a serpentine-body of about half a mile long and several hundred feet wide consisting predominantly of dark green serpentine. The body has a general direction of N 60° W and shows much shearing in a direction about NW-SE. It is in this outcrop-series that the association of asbestos in serpentine with shearing in a general NW-SE direction is easily demonstrated. Only in the center of the body, where the major shearzone passes, asbestos can be found. It is a fiber of very poor quality, hard and brittle, of about 1½ in. long; the asbestos-fluff too is hard and sharp. In all the secondary shearzones and fractureplanes the asbestos formation is incomplete; the fibers are very long and brittle and consist probably of antophyllite. The fibers are tangential to the fracture-planes. In the main shearzone only the transition from this tangential anthophyllite to asbestos (perpendicular to the fracture-planes) can be seen. It is very interesting to notice that this serpentine/asbestos-showing is located on a straight line between the Cassiar-Caley serpentine/asbestos and the recently discovered Clinton serpentine/asbestos. It seems to be very probable that this NW-SE shearing has been a important agent in the formation of the latter asbestos occurences. The presence of a second shearzone lineament seems to be indicated in this area (air-photograph mozaik!) having a general direction NE-SW. It might be well possible that the occurence of asbestos in serpentine is associated with the intercrossing of the two major shearzone patterns. I have not been able to establish a certain regularity in the occurence of the serpentine bodies, however the straight-line connection of the Cassiar Creek, Fortymile-river and Clinton Creek serpentine bodies together with the general direction of the second occurence might have an important bearing to this problem, as indicated by the outcrops found halfway between Silver City and Cassiar-Caley Creek.

Probably also anthophyllite

a similar structural control seem to valid for the occurence of talc-bodies in this area.

i. structure.

From the measurements along this stretch of Yukon river it is not so easy to determine a general direction of folding, however a general direction NE-SW in the south-eastern parts and a general direction NW-SE in the north-western parts seem to be present. This has been confirmed by measurements on foldaxis of detail-folds in both areas being respectively NE and approximately SE. If these both areas of different folding are indeed present, the observation of angular disconformity (as I presume it is although I have not been able to confirm this assumption by observations "in situ") at the mouth of Chandindu River on the left bank of Yukon river, might have considerable importance. This unconformity could mark the division between older, generally NE-SW folded, rocks and a younger, generally NW-SE folded, series.

Both rockseries are tightly folded and show an intricate ptychmatic folding in the incompetent micaschists and quartz-poor gneisses; boudinage in the quartz-rich gneisses is quite common. Very sharp anticlines and synclines following each other within a few hundred feet are very general; in one place a very sharp anticline, distinctly overturned to the west, has been found (near Cassiar Creek).

Especially the more competent members of the rock-series along the whole stretch of this part of the Yukon show a very pronounced fracture-pattern; the major joints have a general direction NW-SE, the secondary fractures show a direction between N-S and NE-SW. All fractures have a very steep dip and often are semi-vertical. Several major faults along the first of these directions have been observed and it is presumed that also faults following the second direction are present. Nearly all of the basic crosscutting dykes are located on this fracture-pattern. Many of these dykes show a soft S-curved appearance which might indicate a slight, post-intrusive, movement.

The former remarks are only based on a very few observations and are therefore merely suggestive and subject to severe criticism. However, if they are correct, the following geological history might be a possibility:

a. folding in a general direction NE-SW
b. disconformity
c. folding in a general direction NW-SE
d. shearing and formation of fracture-pattern
e. slight, post-intrusive, tectonics.

II. Some remarks on the Clinton Creek area.

A formal geological report on the serpentine/asbestos occurence of Clinton Creek is not possible because of the extreme rareness of outcrops. The very few outcrops found are not conclusive and do not permit a clear picture of the geology involved.

Probably the area consists mainly of a metamorphic sedimentary series in which limestones and slates predominate together with the known serpentine-bodies. A general trend of strike in the series could not be determined although the rare measurements seem to indicate a possible SW-NE strike of limestones and slates. The trend of the serpentine-body is probably NW-SE as it is in the surrounding areas (see report on the Yukon-geology) but the occurrence of serpentine on the Chief-claims (N to NE of the Conwest-property) might indicate a second direction of strike: approximately SW-NE. Reconnaissance-trips across these presumed continuations failed to support these notions because of lack of outcrops and/or float. The same is true for all other trips made in this area. In general it can be said that this region is not fit for ordinary prospecting and simple geological methods. Extensive soil-sampling might possibly be a good method to determine the character of the underlying bedrock.

The Polar- and Dates-series of Claims (Joe Soucy and Henry Henry) have been checqued very carefully. These claims are located mainly on the lower parts of the Clinton Creek valley-sides; As far as ordinary geological methods are concerned it seems safe to say that serpentine will not be found on these claims. The only outcrops found consist of limestones (green!) and black slates. The claims are completely off the presumed directions of strike of the serpentine-body.