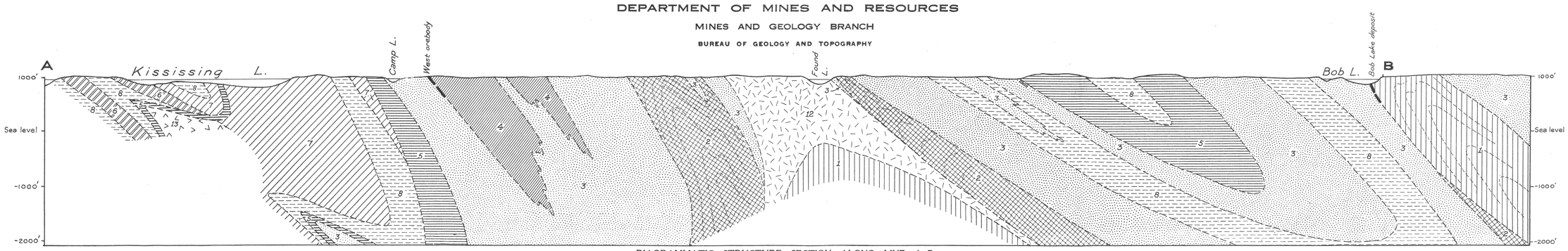
CANADA

DEPARTMENT OF MINES AND RESOURCES

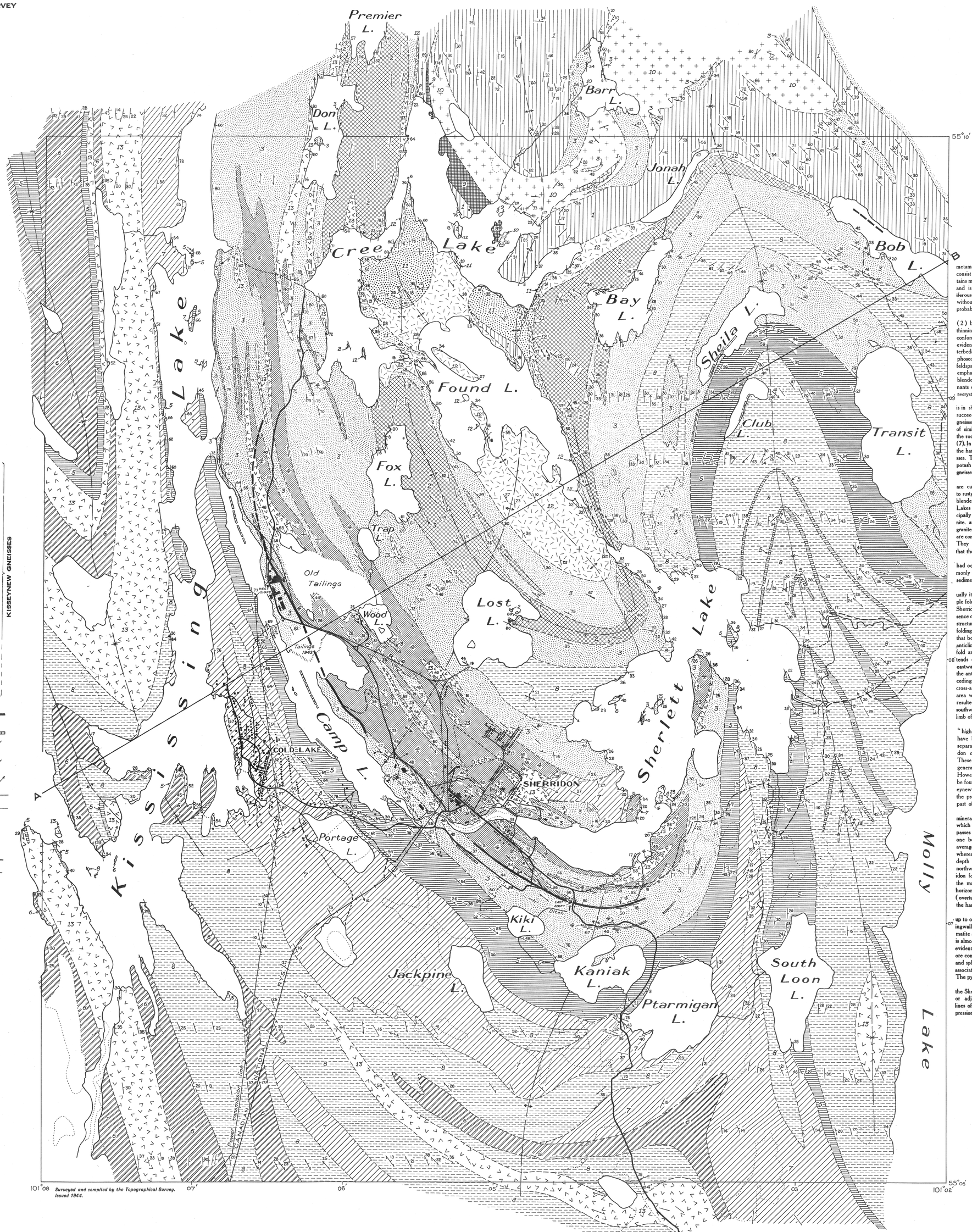
MINES AND GEOLOGY BRANCH

BUREAU OF GEOLOGY AND TOPOGRAPHY



DIAGRAMMATIC STRUCTURE SECTION ALONG LINE A–B

GEOLOGICAL SURVEY



LEGEND

ARCHAEAN AND/OR PROTEROZOIC

- Granite, granite-gneiss; pegmatite
- CREE LAKE INTRUSIVE ROCKS (Post-Sherridon, relation to post-Sherridon Kisseynew gneisses uncertain)
- Oligoclase granite
- Anorthosite, anorthositic gabbro
- Garnetiferous metagabbro
- Pyroxenite
- POST-SHERRIDON
- Stratiform, granitoid oligoclase-quartz gneiss
- Stratiform "granitized" gneiss including lit-par-lit and other injection gneisses
- Stratified quartz-feldspar-biotite-garnet gneiss; minor hornblende gneiss
- Hornblende-plagioclase gneiss, in part garnetiferous; pseudodiorite
- SHERRIDON GROUP
- Hornblende-plagioclase-garnet gneiss, in part pseudodiorite
- Gneissic quartzite, feldspathic quartzite, biotite, hornblende, and garnet-bearing quartzites; granitized equivalents; minor hornblende gneiss; small bodies of granite, granite-gneiss, and pegmatite

KISSEYNEW GNEISSES

- PRE-SHERRIDON
- Hornblende-plagioclase gneiss, pyroclastic breccia; part may be intrusive
- Stratiform quartz-oligoclase-biotite-garnet gneiss

- Copper-zinc orebody (exposed, top projected vertically to surface)
- Pyrrhotite deposit (exposed, top projected vertically to surface)
- Bedding (horizontal, inclined, dip unknown)
- Schistosity, gneissosity, foliation (inclined, dip unknown)
- Direction of plunge (indicated by arrow)
- Anticlinal axis
- Synclinal axis

Geology by J.D Bateman, 1943

- Road
- Trail
- Marsh

Surveyed and compiled by the Topographical Survey. Issued 1944.

DESCRIPTIVE NOTES

Most of the rocks in the area are crystalline schists and gneisses that represent metamorphosed sedimentary and volcanic formations. The oldest rocks (Pre-Sherridon) consist of stratiform quartz-oligoclase-biotite gneiss (1) which weathers buff and contains many garnetiferous beds. This gneiss is a metamorphosed sedimentary formation and is overlain by dark green hornblende-plagioclase gneiss (2) that is locally garnetiferous. The dark gneiss is, in places, thinly foliated and, elsewhere, is massive and without visible structures. Part of it contains light-coloured lenticular fragments and was probably a volcanic breccia.

The Sherridon group (3,4) lies in places upon the pre-Sherridon basic gneiss (2) but elsewhere upon the older sedimentary gneiss (1). This may be due to the thinning out of the former volcanic member along the strike, or it may represent an unconformity at the base of the Sherridon. The latter alternative is indicated by structural evidence. The Sherridon consists of a group of distinctive white to grey quartzites interbedded with dark green to black hornblende-plagioclase gneisses that are metamorphosed volcanic flows. The different quartzite beds contain various minor amounts of feldspar, biotite, hornblende, and garnet. They have a distinct gneissic texture that is emphasized by the quartz, which stands out in relief on weathered surfaces. The hornblende gneisses are most abundant northeast of the Sherritt Gordon west orebody. Remnants of pillow structures were observed in them; but the rock is generally so thoroughly recrystallized that it resembles diorite.

The Sherridon group is overlain by dark green hornblende-rich gneiss (5) that is in sharp contact with the distinctive Sherridon quartzites. The hornblende gneiss is succeeded by widespread metamorphic types representative of the prevailing Kisseynew gneisses throughout the district. They vary from recognizable stratified rocks (6) to others of similar origin that have been so injected by granite and pegmatite that the bulk of the rock is intrusive and, for purposes of mapping, are classed as "granitized" gneisses (7). In addition there are granitoid gneisses (8) that resemble granite or granodiorite in the hand specimen but that have a stratiform structure similar to that of the bedded gneisses. These differ from the true granites in that they contain more quartz and little or no potash feldspars (microcline and microperthite). They probably represent sedimentary gneisses in an advanced state of granitization.

In the vicinity of Cree Lake the older formations, including the Sherridon group, are cut by a related sequence of basic to granitic intrusive rocks. These include black to rusty weathering pyroxenite (9), and black to dark green massive peridotite and hornblende metagabbro (10), the latter carrying abundant garnet. Between Cree and Found Lakes are several bodies of anorthosite and anorthositic gabbro (11) that consist principally of plagioclase feldspar with more or less pyroxene, hornblende, carbonate, titanite, and scapolite. The youngest member of this sequence is a buff coloured oligoclase granite (12) that is locally sheared and rusty weathering. The Cree Lake intrusive rocks are considerably altered and the pyroxenite and anorthosite have a decayed appearance. They are considerably carbonatized and some calcite is developed locally. It is probable that these rocks were involved in at least some of the folding.

The younger granite and granite-gneiss (13) was intruded after the main folding had occurred and is mostly in the form of small sills. It is characteristically pink and commonly has some faint stratiform structures that correspond in attitude to the bedding in the sedimentary gneisses.

The broad structural picture at Sherritt Gordon resembles a large drag fold. Actually it is not a drag fold, but the result of complex cross-axial folding on a series of simple folds. Evidence of a still earlier folding is represented by a folded anticline in the pre-Sherridon hornblende-gneiss encircling Found Lake. This structure accounts for the presence of some Sherridon quartzites on the Found Lake side of the hornblende-gneiss (See structure section). Similar types of folds occur within the Sherridon group. The principal folding, however, is along the north-south axes, the folds being overturned to the west so that both limbs dip eastward. The present structural picture is the result of a cross-axial anticline on the southeast limb of which the prevailing northward plunge of the principal fold axes is reversed. This anticline commences as a gentle fold near Cold Lake and extends eastward between the Sherritt Gordon east and west orebodies, swinging northeastward across Found Lake and northward across Cree Lake. North of Found Lake the anticline steepens until, northeast of Cree Lake, it becomes the principal fold, superceding the main syncline on the east, which dies out to the north. As a result of the cross-axial folding this syncline plunges southward, except at the south part of the map-area where the prevailing northward plunge is resumed. Similarly the cross-axial fold has resulted in a southward plunge of the anticlinal axis that extends through Found Lake southward through Sherlett Lake; but to the northwest of Found Lake, on the north limb of the cross-axial fold, the plunge is northward.

The combined effect of these folds has resulted in an anticlinal dome or structural "high" at Sherritt Gordon, in which the older formations of the Kisseynew gneisses have been exposed. The Sherridon group may represent the lowest Kisseynew rocks, separated by a structural unconformity from pre-Sherridon formations. The Sherritt Gordon orebodies occur, therefore, in a structurally complex area of Kisseynew gneisses. These gneisses extend over a large part of northern Manitoba and Saskatchewan and, generally, do not provide favourable host rocks or structures for economic mineral deposits. However, there is every possibility that structures similar to those at Sherritt Gordon may be found elsewhere in this region wherever sharp anticlines have brought the older Kisseynew formations to the present erosion surface. Such structures may be recognized by the presence of more abundant hornblende gneisses (dark rocks) that occur in the lower part of the Kisseynew group.

The Sherritt Gordon east and west orebodies are one of the most remarkable mineral deposits in the world, having a combined total length of almost 16,000 feet, of which 3,600 feet between the two orebodies carries no ore. As the cross-axial anticline passes through this barren interval it is probable that the two orebodies formed a single one before being reduced to the present erosion surface, The main orebodies have an average width of about 15 feet. The east orebody is approximately 250 feet deep, whereas the west orebody is 500 to 800 feet deep and rakes northward to a maximum depth below surface of about 1500 feet. As the orebody tends to flatten out down the northward rake (the flattening of the dip resulting from an internal fold in the Sherridon formations), the vertical projection of the top of the ore to the surface is shown on the map as angling across the formations, although it actually follows a stratigraphic horizon. A relatively pure quartzite member of the Sherridon group forms the footwall (overturned hangingwall) of the ore, whereas hornblende-gneiss is generally on or near the hangingwall.

In the west orebody, particularly, there were subsidiary orebodies that contained up to one-half million tons of ore, and that occurred as bulges or offsets into the hangingwall. These offset orebodies are almost entirely in pegmatite. Small amounts of pegmatite are also found at several places in the main orebodies, and the Bob Lake deposit is almost completely enclosed in such rock. The ore is later than the pegmatite and has evidently been introduced along channelways in which the pegmatite was intruded. The ore consists chiefly of pyrrhotite containing quartz nodules and more or less chalcopyrite and sphalerite, the east orebody being higher in zinc. Pegmatite is less conspicuously associated with several pyrrhotite deposits that contain little or no copper-zinc minerals. The pyrrhotite deposits are commonly in shear zones containing graphite.

All the sulphide deposits, including the orebodies at Sherritt Gordon, occur in the Sherridon quartzites, either near contacts with the underlying or overlying formations or adjacent to hornblende-gneiss within the Sherridon. As these contacts represent lines of structural weakness the sulphide deposits are generally beneath drift-filled depressions or lakes, and thus not exposed to view.

PRELIMINARY MAP 44-4

SHERRITT GORDON MINE AREA

WEST OF PRINCIPAL MERIDIAN

MANITOBA

Scale:- 1 inch to 1000 feet

1000 0 1000 2000 3000 4000 5000