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REPORT ON

WESFROB MINES LIMITED

GEOLOGY

To March, 1964

April 10, 1964

G. K. Polk

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Vancouver, B. C.
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103-C-9

**REPORT ON**

**WESFROB MINES LIMITED**

**G E O L O G Y**

**To March, 1964**

**LOCATION:**

The property is located at Lat. 52°46'N, 132°02'W on the south shore of Tasu Sound on the West Coast of Moresby Island which is the southernmost of the two main islands of the Queen Charlotte group. Tasu Sound should be suitable as a harbour for ocean-going ships. The sailing distance to the property from Vancouver is 500 miles and from Prince Rupert, 250 miles.

Sandspit airport is the closest regular airport and is approximately 35 miles from the mine.

**HISTORY:**

In the years 1907 and 1909 the Tassoo Mining and Smelting Co. Ltd. staked a group of 17 claims. From 1913 to 1918 the recorded production was 5180 tons of cupriferous magnetite which was shipped to Tacoma. (This contained 94 oz. of gold, 1408 oz. silver and 165,566 pounds of copper.)

In 1953, two key Crown granted claims known as the Warwick and the Tassoo were bought at a Sheriff's sale by St. Eugene Mining Corporation Ltd. Nineteen additional claims were acquired before 1956.

In 1956 W sfrob Mines Limited was formed and exploration work commenced. In late 1957 the exploration was suspended due to provincial regulations which were brought into effect at that time and which affected directly the export of iron ore.

In 1961 exploration was resumed. The work of delineating and sampling the extensive mineralized zones has continued to date. Additional claims have been staked.

During 1962-63 a feasibility report was prepared by Wright Engineers Ltd. of Vancouver.

CLAIMS:

The company property consists of a total of 88 claims consisting of 67 recorded claims and 21 Crown granted claims. The claims are indicated on the claim map, Fig. 1.

TOPOGRAPHY, ETC.:

The topography in the vicinity of the ore deposits is mountainous and rugged. Average slope over the mineralized zone is $30^{\circ}$ but this slope is not constant due to many steep pitches and the occasional steep-sided gully or cliff.

Bed rock is very close to surface. The soil layer is usually only 3 to 6 feet thick. Outcrop averages about 15 to 25% of the total area overlying the mineralized zones but bed rock near surface has been variably deteriorated by weathering processes resulting in friable, broken oxidized material. This zone of weathering extends to 20 or 40 feet below the surface. Many of the rocks, especially the intrusives, appear to be little affected by superficial surface weathering but the outcrops of host rocks for mineralization are usually poor.

REGIONAL GEOLOGY: GENERALIZED (See Regional Geology Map. Fig. 2)

The oldest rocks in the area are fine-grained amphibolite greenstones derived from volcanic rocks of the Vancouver group that are co-relatives of the Karmutsen formation of Northern Vancouver Island.

(Late Paleozoic or early Upper Triassic.) The older volcanics are normally overlain conformably by a thick massive limestone (Early Upper Triassic or Karnian) which in turn is overlain by thin-bedded dark limestones and argillites (Upper Triassic-Karnian; Norian to Early Jurassic.) which together form the Kunga formation.

In the vicinity of the Tasu orebodies however the base of the Kunga limestone is in places separated from the older volcanics by a complex sequence of sedimentary beds that have been more or less completely metasomatized to epidote, garnet, pyrite skarn. These rocks are intercalated with masses of porphyritic or porphyroblastic feldspathic andesite known locally as "mottled porphyry" which appears to be mainly concordant with the bedding. The mottled porphyries have also been partially altered to skarn.

The sedimentary and volcanic rocks have been intruded by the San Cristoval batholith of hornblende diorite. (See Regional Map Fig. 2). The mottled porphyries are thought to be products of the early stages of the intrusion of the batholith.

Most of the magnetite-copper mineralization occurs as selective replacement of skarn and of certain beds within the skarn mottled porphyry sequence, usually immediately above the underlying older volcanics. Much mineralization also occurs as replacement of limestone at or near the base of the Kunga formation. In many respects the deposits may be described as being sheet like. Structural conditions caused concentration of the mineralization in certain locations. In these areas the zones are thickest but away from the structural controls the zones thin out or fade. The result is a sheet-like structure with pronounced pinch and swell features. For full description see "Mineralization".

The Kunga formation is locally overlain unconformably by fragmental andesites of the Yakoun formation. (Middle Jurassic.)

Numerous dykes and sills of porphyritic, feldspathic diorite (Grey Porphyries) occur within the area. These intrusives form a gradational series, the early representatives of which resemble the "mottled porphyries". Some of these intrusives have been partially altered to skarn. The early grey porphyries definitely cut all of the aforementioned rocks with the exception of the Yakoun Formation. Later grey porphyry intrusives become progressively more mafic and grade insensibly into diorite glomeroporphyry. (Diorite Porphyry.)

Abundant dykes of basalt and gabbro intrude all of the rocks. Some of these are pre-dark grey porphyry in age but most appear to be post-Diorite Porphyry.

REGIONAL STRUCTURE:

The structure of the pre-diorite rocks on the south shore of Tasu Sound consists of a main syncline trending N30°W to NW and plunging 20° in that direction.

Secondary anticlines occur on each limb. The easternmost anticline trends EW to WNW and plunges about 20° to the west. This anticline is known as the "Ore Zone Anticline" or Ore Zone Arch.

The assemblage of sediments and volcanics lies immediately to the north of the northernmost extremity of the San Cristoval batholith. The folding was probably a result of the intrusion of this batholith.

In the vicinity of the mineralized zones the volcanics and sediments are thought to constitute only a thin wedge overlying the diorite. The diorite contact may dip quite gradually to the north west.

The whole area is highly fractured. Many faults are known. The main fault systems in the area of the Ore Zone Anticline are thought to be 3rd and 4th order to the main wrench system which strikes N30-35° west parallel to the Denali Fault whose trace follows the steep continental shelf along the west coast of the Queen Charlotte Islands.

SEQUENCE OF EVENTS: See Sequence Table (Tab. 2)

(a) Older Volcanics: The oldest rocks in the area are fine-grained amphibolite greenstones. These were derived from volcanic rocks of the Vancouver group that are co-relatives of the Karmutsen formation of northern Vancouver Island. (Late Paleozoic or Early Upper Triassic).

The older volcanics definitely pre date all sediments in the area. They are also cut by all known intrusives.

(b) Tweed Porphyry: An unusual form of porphyritic feldspathic diorite is thought to be intrusive, but it has never been observed cutting any rocks but the Older Volcanics where it appears to occur as sills.

(c) Faults: See "Faulting". There is some evidence that the Older Volcanics were faulted prior to the deposition of the Kunga Formation. Several systems of faults were developed. Several faults are indicated on the structural map of the Older Volcanics. (Fig. 3A.) Scarps were formed by the faulting. The shape of the block indicated between faults 1 and 4 suggests that it was perhaps a complex uplift horst or broken fold arch bounded by the fault scarps. There is reason to believe that the faults were only partially developed prior to the deposition of the Kunga formation and there is evidence that the faults were active for a long period of time, probably until the late Jurassic (Post Kunga.).

(d) Minor Erosion: The foregoing surface was slightly modified by erosion. Valleys developed along the various fault lines and the scarps were somewhat modified. Faulting may have continued during this period.

The fault line valleys and scarps are indicated on the Contour Plan of Basement Surface. (Fig. 3A.)

(e) Kunga Formation: Upper Triassic: based on description by A. Sutherland Brown (BCDM) 1) Base: Massive grey limestone (Karnian) was deposited over the aforementioned Older Volcanic surface.

2) Lower Center: (Karnian-Norian). Thin bedded black limestones overlay the massive grey limestone.

3) Top: (Norian-Early Jurassic): Argillites and argillaceous limestones overlie the aforementioned rocks.

(f) Evidence for Pre-Kunga erosion of older volcanics and for age of faults. See Pre-Kunga Faults.

1. The fault-line valley system is apparently due to erosion. See Fig. 3A. A branching drainage pattern is suggested by the contour plan of the basement surface (Older Volcanics portion.)

2. The scarps appear to have been somewhat rounded and modified.

3. In places the Kunga formation appears to lap against the Older Volcanics.

4. Slumping is evident in portions of Kunga Formation and especially adjacent to old fault scarps would suggest that Kunga was deposited on a comparatively broken surface.

5. Faulting offsets have been noted in the Kunga formation over the scarps (indicated by the basement contours) but displacements are not nearly of the order of magnitude indicated by the scarps.

(g) Maude Formation: Late Early Jurassic (Toarcian). The Kunga Formation is normally overlain by the Maude Formation, but in Tasu Harbour the Maude is missing. It is normally composed of grey shales, blocky dark grey argillite, calcareous shale; greenish-grey sandstone. Normally the Maude has conformable relationships with the Kunga.

(h) Yakoun Formation:(Early Middle to Early-Late Jurassic) In Tasu Sound the Kunga formation is overlain, usually with apparent unconformity by the Yakoun formation which is composed mainly of Andesite agglomerate, scoria, etc.

Elsewhere the Yakoun bears conformable relationships with the Maude Formation.

(i) Folding and Faulting:(Middle Jurassic)? The Ore Zone Arch or Anticline trending E-W and plunging 20°W may have been formed during the middle Jurassic. As the folding is thought to have been due to the intrusion of the San Cristoval Batholith it is probable that the folding might have started as far back in time as Upper Triassic (Kunga), but the main folding probably reached a climax during the middle Jurassic. The Yakoun formation probably represents volcanism associated with the batholith intrusion.

Uplift movement was taken up in the older volcanics by fracturing and by fault movements and possibly also by folding whereas movement within the limestones was probably taken up mainly by folding with some fracturing and faulting over the old fault lines in the basement.

(j) Intrusion: Feldspar Porphyry Intrusives: Tweed Porphyry:(?) Mottled Porphyry: White Porphyry.

Aside from the Tweed Porphyry, which may have been pre-Kunga, the first intrusives in the area are feldspar porphyry masses which represent the border phases of the first stages of intrusion of the San Cristoval batholith. The age of this group of rocks is not accurately known but they are thought to be middle Jurassic.

(k) Emanation Effects: 1) Feldspathization: Hornfels: Mottled Porphyry (in part).

2) Pre-ore skarns: Certain of the rocks were then

altered by (Fe? Mg?) metasomatism to garnet epidote chlorite skarns. See Rock Descriptions, also Skarns.

2.a Skarns replace silty or argillaceous beds in limestone (Dark Skarns)

2.b " " limestone directly.

2.c " " Mottled Porphyry: Feldspathization or Hornfels. (Tan Skarns)

2.d " " Older Volcanics: rare.

3) Mineralization: mineralization followed the skarns and probably represented a phase of the skarn metasomatic process.

Constituent minerals: 3.a Magnetite

3.b Pyrite

3.c Chalcopyrite

3.d Sphalerite

3.e Trace Hematite

Mineralization is described separately.

(1) Intrusion: 1) A few dykelets of gabbro or basalt (Older Gabbros) are known to cut the ore zones.

2) Grey Porphyry and White Porphyry Dykes (derivatives of the Diorite) cut Ore Zones and the older gabbro dykes. These porphyries occur as dyke swarms trending NW, with variable dips.

3) Dark Grey Porphyry dykes: as intrusion progressed the feldspathic diorites became more and more mafic. (See Tables 1 & 2.

4) Diorite Glomeroporphyry: (Diorite Porphyry). Further differentiation resulted in a gradation to diorite porphyry. These dykes run NW to NNW and usually dip 40° or 60° to the east.

(m) <u>Post Ore Skarns</u>: Several of the white porphyry intrusives have been slightly altered to epidote garnet skarns. This post-ore skarn is not common.

(n) <u>Gabbro Dykes</u>: The youngest intrusives in the area are a suite of basic dykes of gabbroic derivation. These strike N-S to N20E and usually dip 60 to 70° to the east. They are probably Tertiary in age.

<u>POST ORE: Faulting & Fracturing</u>:

Considerable movement has taken place subsequent to the ore deposition. The grey porphyries were intruded along a tensional fracture system that trended NW and dipped 60° to the NE or SW. The dark grey porphyries and diorite porphyries intruded along a tensional system of fractures striking more NNW. Dip 60° to E. Most of the gabbroic dykes occupy a tensional system striking N-S dipping 70° E. It would therefore appear that as time went on the tensional direction changed from SW-NE to E-W, resulting in a swing in the strike of intrusion from NW to NS.

The extreme complexity of the fracture and intrusion systems makes the deciphering of fault movements almost an impossibility. There is much evidence of considerable movement being spread out over innumerable fracture surfaces. Individual fault lines with obvious large displacements are not readily recognized on surface.

The northeasternmost portion of the ore zone is truncated by a NW striking fault that probably dips 80° to the NE. The N-E off-set zone is considered to be the faulted extension of the main zone. A wrench movement is therefore indicated with south side moving relatively west. Movement on this fault is pre-gabbro in part.

## FORMATION DESCRIPTIONS

Older Volcanics: (Smokey): See Rock Descriptions:

The oldest rocks in the area are fine grained amphibolite greenstones. These were derived from volcanic rocks of the Vancouver group that are co-relatives of the Karmutsen formation of northern Vancouver Island (Late Paleozoic or Early Upper Triassic).

The original nature of these rocks is obscure, but amygdaloid-like relict forms suggest that they were flows or possibly incandescent tuffs. Aside from the amygdaloidal forms there is no other evidence of flow activity or of any structure that can be readily traced.

In places the rocks have been variably bleached. The areas of bleach are extremely irregular in outline but usually the bleaching is concentrated near shears or fractures in the rock or occurs as a halo around intrusives Bleaching is not so evident away from the ore zones.

The older volcanics are characterized by a network of fine carbonate veinlet fracture fillings.

It is thought that the greenstones in the vicinity of the ore zones constitute only a thin skin or wedge between the overlying limestones and the diorite below.

The older volcanics have been altered to skarn but the total amount of skarn is small.

Mineralization occurs only rarely and in small amounts within the older volcanics.

Mineralization and skarn where seen are nearly always confined to fractured areas in the immediate vicinity of major faults that are known mineralization channels.

The surface of the older volcanics now represents an arch that has been much broken by faulting. (See Basement Surface Fig. 3A) Some of the faulting and/or folding that caused the arch probably took place prior to the deposition of the Kunga Formation overlying the Older Volcanics.

The older volcanics are in most cases the footwall rock for the mineralized zones.

Kunga Formation: Upper Triassic: (Base):

Normally the base of the Kunga formation consists of a massive grey limestone of Karnian age that was deposited over the Older Volcanic surface. In the vicinity of the mineralized zones the grey limestone is seldom recognizable due to recrystallization to white calcite or marble.

No fossils have been observed within this rock at Tasu but elsewhere the facies is characterized by Karnian Ammonites.

As this rock constitutes a host for much of the mineralization a knowledge of its structure and composition is important. (See Ore Controls). This information might only be obtained at some distance from the mineralized zones where the rock is relatively unaltered. At present very little is known of its local unaltered composition.

In places the bedding appears to lap against the underlying older volcanics.

Kunga Formation: Lower Center (Karnian-Norian)

Regionally the grey limestones are overlain conformably by thin bedded black limestones. This facies is characterized by Minotis and Halobia. Both pelagic fossils.

Ammonites were also observed within these beds. There is no sharp line of demarcation between the grey limestone and the overlying thin-bedded limestones, but, in the vicinity of the ore zones the thin bedded limestones may usually be seen from 250 to 350 feet above the ore zone. Recrystallization makes doubtful the use of this facies as a structural marker. Certain beds of the thin bedded limestones containing the occasional argillite parting may, however, prove to be structural markers.

There is considerable evidence of slumping within this sequence of beds. There is probably a relationship between this slumping and the underlying basement topography. There is also the possibility that faulting was active, or intermittent during the time of Kunga deposition.

On the point to the north of the ore bodies and along the shoreline for 1/4 mile to the west of Horn Island the thin bedded limestones are variably altered to hornfels.

Kunga Formation: Top: (Norian-Early Jurassic)

Argillites and argillaceous limestones normally overlay the thin bedded limestones. These rocks are characterized by arniocerated ammonites but none have been observed at Tasu. Locally the upper portion of the thin bedded limestone is intercalated with beds of black massive limestone. This sequence may constitute a recognizable formation.

Kunga Formation: General

Little is known about the detailed internal structure of the Kunga Formation. Over the eastern portions of the mineralized zones where work has been most concentrated the relationships are so obscured by recrystallization that various horizons cannot be traced. To the west of the area of detailed work the drilling is too scattered to give a good interpretation.

There is some evidence of slumping within portions of the Kunga.

Locally the Kunga Formation has been arched to form an anticlinal structure. See "Ore Zone Anticline". Although thicknesses of the component beds are apparently quite variable there is the suggestion that the beds thin towards the crest of the arch.

Folding and Faulting: (Early Jurassic)

The folding of the Ore Zone Arch (trending EW and plunging W20°) may have started during the Upper Triassic and continued until the folding reached a climax when the San Cristoval batholith was emplaced.

This anticline-like structure lies astride the horst block between faults 1 and 4 or may extend even further to the south (Basement Contours Map. Fig. 3A). As some of the faulting resulting in the broken arch, or horst structure, is thought to be pre-Kunga (see Page 6, Par. (f), Sequence of Events) and as the shape of the anticline closely approximates the shape of the horst, it is considered probable that the anticline was at least partially supratenuous in nature. The original drape structure was probably further accentuated by folding. There is some suggestion of thinning of beds towards the crest.

It is thought that uplift movement within the older volcanics was taken up mainly by faulting and possibly with associated minor folding whereas movement was taken up within the limestones mainly by folding. There is evidence of some pre-ore faulting in the Kunga.

Fracturing and faulting in the limestones mainly above the fault-line scarps in the basement indicates that these faults were active subsequent to the deposition of the limestones.

The ore zone arch constitutes an important structural control for the mineralization. The crest of the basement surface trends more or less east-west. To the north of this crest the sediments apparently strike NE to N60°E and dip 30 to 45° to the NW. To the south of the crest and within the #3 Zone Area the strikes average N30-40E and dips 20-30° to the NW. The top of the arch between 3 and 2 Zones is relatively flat but farther to the west, where the arch is floored with diorite the arch crest is much sharper and strikes on the south flank swing to N30°W. Dips to the SW 25-30°.

The relationship of the iron content (within the mineral zones) to the structure is indicated on the Iron Distribution Plan. Fig. 3B.

MINERALIZATION CONTROLS:

1) Ore Zone Arch (or Anticline): The relationship of the mineralization to the arch structure is well established. See Figure 3A which indicates contours of the basement surface (underlying the Kunga Limestones) which normally constitutes the footwall of the mineralization. Fig. 3B indicates the iron distribution as related to the "Arch" structure and to other controls.

2) Limestone-Greenstone Contact: Most mineralization is concentrated just above the Kunga-Older Volcanics contact. See Sections.

3) Fault Channels: Mineral concentration is greatest over the old faults in the basement which undoubtedly acted as channels for the mineralization. See Contour Map indicating iron distribution Fib. 3B and compare with contour map of basement indicating numbered channel faults.

4) Replacement of Limestone: (a) Certain beds of the limestone are selectively replaced which suggests a physical as well as a chemical control. Replacement is especially selective and apparently follows silty or argillaceous beds.

5) Replacement of Skarns: (a) After Limestone: the skarns selectively replaced certain silty or impure beds. Bedding texture remnants are retained in the skarns.

(b) After Mottled Porphyry: (1) Along borders of intrusives (rare).
(2) Along certain horizons in mottled porphyry.
(3) In breccia zones in porphyry.

(c) After Older Volcanics: Rare.

6) Replacement of Fracture Zones: (a) Replacement of limestone breccia in areas of flowage or usually close to old channel faults.

(b) Replacement of skarn breccia close to channel faults.

7) Folding: The east-west trending Ore Zone Arch is the major ore control but minor folds in the limestones may also be important as ore controls.

INTRUSIVES: (A) Pre-Ore:

(a) Tweed Porphyry: the oldest intrusive may be an unusual form of feldspathic diorite porphyry known as the Tweed porphyry. This porphyry apparently occurs as sills, but it has been observed only within the older volcanics. It may be pre-Kunga in age.

(b) Feldspar Porphyry: The oldest known intrusives in the area are feldspar porphyry masses which may represent the first stages of intrusion of the San Cristoval batholith. The age of this group of rocks is not known accurately but they are thought to be pre-Yakoun and may therefore be related in time to the pre-Maude folding (Early Jurassic).

See Table 1 and 2 - Also Rock Descriptions.

The main bodies of feldspar porphyry occur as irregular masses along the shore line to the NW of the ore zones. (See Regional Geology. Fig. 2) Locally this porphyry is known as Mottled Porphyry. Some of this mottled porphyry is known to be intrusive, but much of it may well be the result of feldspathization or silicification of existing rocks, i.e. (silty or argillaceous limestones).

The mottled porphyry is known to grade into hornblende diorite and is probably a border phase of that rock. In the vicinity of the shore line masses of porphyry the Kunga Limestones and limey argillites have been altered to a feldspathic hornfels. There appears to be a gradation from diorite to mottled porphyry to hornfels or feldspathization then to sediments.

The older volcanics underlying the northern limb of the ore zone arch are separated from the Kunga sediments, which normally overlie them directly, by a variable thickness of the mottled porphyry. The mottled porphyry sequence appears to thicken to the north away from the crest of the arch.

As much of the mineralization occurs as selective replacements of the mottled porphyry horizons a knowledge of the origin of the porphyry is of importance. Although some of the mottled porphyry is undoubtedly intrusive in nature (as indicated in #2 and #3 Zones) many of the occurrences resemble beds more than sills. It is postulated that certain beds near the base of the Kunga were silicified and feldspathized due to underlying intrusive of diorite and later the diorite encroached by intrusion on its own zone of feldspathization.

(b) 1. Feldspathization has bean observed: it is remarkable in that the alteration is extremely selective and follows certain beds closely. Contacts are sharp.

(b) 2. The process of metasomatic feldspathization is considered to be of practical interest in that it is occasionally accompanied by the formation of magnetite lenses in fault areas. A known occurrence is in the northern West Sayan mountains in Siberia, where porphyritic albitites, previously thought to be intrusive, are now known to be of metasomatic origin. (addition of aluminum.)

(b) 3. On the Kasaan peninsula of Alaska similar rocks are described as being "unusual sills - if they are sills."

(b) 4. At Tasu it was originally thought that these rocks were glowing avalanche deposits, but the prevalence of feldspathization in the area suggests that a metasomatic origin may be the explanation. Elsewhere in B.C., however, the rocks have been described as "volcanic breccias."

Surface exposures of the mottled porphyry are usually poor and relationships are difficult to determine. See Fig. 3, Geological Plan.

Because of uncertainty as to the origin of the Mottled Porphyry and because of its importance as a host rock for the mineralization it may readily be understood that projections based on wrong interpretations could easily result in significant errors within the ore reserve. It was therefore found advisable to drill sufficient holes so that incorrect projections would not result in significant errors in grade or in outline. That is to say, the drill sampling is sufficiently adequate so that projection errors for the Mottled Porphyries are of no real significance.

INTRUSIVES: (B) Post Ore:

(a) A few dykelets of gabbro or basalt are known to cut the ore zones. These are possibly the earliest post ore dykes.

(b) Grey Porphyry and White Porphyry Dykes: The mineral zones, the pre-mineral rocks and the older gabbro dykelets are cut by numerous dykes of feldspathic diorite which usually occur as swarms. Thicknesses, strikes and dips of these dykes are variable in detail but the general trend is NW with dips usually 60 to 70° to the NE or to the NW. One swarm of dykes occurs over the #4 fault (3 Zone). Another swarm occurs parallel to this set half-way between faults 3 and 4. (3 and 4 Zones). A third swarm occurs through #1 Zone.

(c) Dark Grey Porphyry Dykes: Age relationships indicate that the feldspathic diorites became more and more mafic as time progressed. A grada onal differentiation sequence is indicated. See Tables 1 and 2.

(d) Diorite Glomeroporphyry: Continued differentiation resulted in a gradation to diorite porphyry. These dykes run NW to NNW and usually dip 40 or 60° to the east: fine grained derivatives of this rock are greenish in colour and are known as dacite-type dykes. (a misnomer.)

(e) Gabbros:(Basalts) The latest rocks in the areas are swarms of gabbro and basalt dykes which usually strike N10E and dip 60-70°E or strike NW with variable, but steep dips (often 70°NE.). Some of the gabbros are definitely pre-dark grey porphyry in age as they are known to be cut by the porphyry. Other gabbros have been cut by the diorite-glomeroporphyry. It therefore appears that the gabbros were injected over a period of time as a system completely separate from the grey porphyry differentiation sequence.

The dykes are usually thin, commonly from 5 to 50 feet thick, but thicknesses up to 100 feet have been observed.

(f) Differentiation Sequence: The differentiation or gradational sequences for the intrusive rocks are indicated on Tables 1 and 2. Also see Rock Descriptions.

EMANATION EFFECTS:

(a) Mottled Porphyry ?: A feldspathization of existing rocks ? Described previously under Intrusives.

(b) Feldspathization & Silicification: The thin bedded sediments of the central portion of the Kunga limestones have been feldspathized and variably altered to hornfels. This has been observed in the sediments on the camp point to the north of the ore bodies. Original bedding may be seen in the altered rock, but as the diorite is approached the bedding fades or is masked by alteration. Along the shoreline to the west of the camp point the result of the alteration of the sediments is a feldspathic hornfels rock. Further metasomatism may possibly result in the "Mottled Porphyry" type of rock. (See Mottled Porphyry). As one proceeds up the road from the camp a transition from feldspathized limestone to mottled porphyry may be seen but it is not known whether the mottled porphyry is in sharp contact with the hornfels (intrusive porphyry) or whether the mottled porphyry is itself an advanced stage of the metasomatism.

Feldspathization and silicification has been observed in the core where it follows certain beds in a remarkably selective manner.

(c) Skarns: Certain of the rocks were altered by Fe, Mg metasomatism to Garnet, Epidote, Chlorite Skarns: Pyrite and calcite also are common constituents of the skarns.

For description of the Skarns see Rock Descriptions, etc.

(c)1. Skarn replaces silty or argillaceous beds in the limestone sequence. This replacement is remarkably selective and usually results in a Dark Skarn. (Garnet Chlorite Epidote) high chlorite commonly.

(c)2. Skarn replaces limestone directly. This replacement apparently takes place in brecciation zones in the limestone and may also occur within flowage areas in the limestones. The resulting skarn is variable in compositon, but it is generally low in epidote.

(c)3. Skarn replaces Older Volcanics. This is not uncommon but these skarns make up only a small percentage of the total. These skarns are variable but tend to be similar to the Dark Skarns previously described (1.)

(c)4. Skarn replaces Mottled Porphyry, Feldspathization or Hornfels. These skarns selectively replace

(i) Brecciated areas in the Mottled Porphyry.

(ii) Certain beds or horizons in the Mottled Porphyry sequence. (These beds within the Mottle Porphyry sequence may have been various beds within the limestones.)

(iii) Certain bands of feldspathization which in turn were selective replacements of silty, limy sediments.

The skarns replacing the Mottled Porphyry are normally a distinctive cream-tan in colour, hence the local designation of Tan Skarn. Porphyroblastic garnets (pale tan to tan brown) often occur in a fine grained ground-mass or the skarns may be massive. Epidote is a minor constituent but it can be locally dominant.

(c)5. Skarn Replacements in Post Ore Dykes: occasionally the earliest members of the post ore grey porphyry dyke sequence are slightly altered to a pale skarn. These skarns occur mainly in the white porphyry type of dyke.

(c)6. Late Skarns: The latest skarns are epidosic and seem to be associated with the Diorite Glomeroporphyry (Diorite Porphyry) and with the Gabbro (Basalt) dykes. This skarn is apparently composed almost exclusively of epidote and might better be described as epidotization. It makes up only a very small portion of the total bulk of the skarns.

(d) Mineralization: Mineralization followed the skarns in the time sequence. The mineralization probably represented a phase of the skarn metasomatic process. Constituents: (1) Magnetite: Commonly fine grained to very fine grained: Occasionally medium grain: Rarely shows crystal structure: Makes up the bulk of the mineralization. (Usually over 95% of total mineralization.): Commonly massive replacements but disseminated and stringer mineralization also common: Selective replacement of limestone or of skarn: Replacement textures common: Probably closely related in time with the skarns.

(2) Pyrite: (a) Commonly occurs as subhedral or euhedral crystals or small blebs disseminated in the magnetite. (crystals $\leq$1 MM to 1/4").

(b) Makes up about 5-10% of the total bulk of mineralization in #1 Zone and about 3-5% of the mineral in #2 Zone. Uncommon in #3 Zone in quantities over 1%.

(c) May also occur as massive stringers or as disseminated halos with massive stringers.

(d) Often the disseminated pyrite is associated with silicification (late stage).

(e) Commonly concentrated in fracture areas or areas of faulting.

(f) Often a vague concentration may be seen at the base of various mineral horizons.

(g) Often hairline concentrations around the periphery of fragments of limestone or skarn that have been incompletely replaced by magnetite. (Usually skarn fragments.)

(h) Quite common as euhedral crystals in several of the gabbro dykes.

(i) Disseminated pyrite probably same age as magnetite, but stringer pyrite with silicification apparently post ore.

(3) Chalcopyrite: A common, but minor, constituent: In #3 Zone averages about 2 or 3% of total mineralization: in #2 Zone about 1/2 of 1% or less: Uncommon in #1 Zone: Occurs as fine blebs, usually in nearly massive magnetite. Blebs usually $<$ 1 MM in diameter. Main concentrations often near base of main mineral horizons. Occasionally occurs as stringers. Zoning in chalcopyrite with values fading away from structural controls.

(4) Sphalerite: Sphalerite occurs occasionally, usually as massive patches in the mineralized zones. The sphalerite is a dark brown-black bladed variety that is exceptionally high in iron: patches up to 2 or 3 feet thick have been observed. Sphalerite occurrences are of little economic significance. The mineral makes up a very small percentage of the total mineralization and local concentrations are too small to be of importance: Disseminated flecks occur quite commonly in the skarns.

(5) Pyrrhotite: Pyrrhotite also occurs quite frequently. Usually as narrow, nearly massive patches in the magnetite: usually it is associated with chalcopyrite: in #3 Zone it makes up 1% of the total mineralization (or more). Disseminations of pyrrhotite are quite common but they are often halos around

more massive stringers.

Pyrrhotite is uncommon in #1 Zone; occurs occasionally in #2 Zone and is a common constituent in #3 Zone.

(6) Hematite: Traces of hematite have also been noted in the mineral zones. It is usually associated with silicification and pyritization: it has no economic significance.

MINERAL ZONES: Description: See Sections (21-36) and (44-90) also Longitudinal Sections and 50 Scale Level Plans

For ease in reference the Zones are numbered from 1 to 5: actually the five zones merge and form one main horizon of mineralization. Each individual zone with exception perhaps of #4 has a structural feature that influenced the mineralization and each can be described more or less as a unit.

#1 ZONE: Strikes on the average N60E and dips 25-35 to the NW. Most of the mineralization in this zone is concentrated over an old fault (#1). This zone extends to the SE to section 62, where the main structural control was the intersection of Fault #2 with Fault #3a.

#2 ZONE: The #1 Zone merges with the #2 Zone which is mainly a buildup of mineralization over faults #3 and the western portion of fault #2. An arbitrary line of demarcation between the #2 and #1 Zones may be described as follows: "East from 11+00W along section 68 to 5+00W then SE to 200 West on Section 60." This line is indicated on the Iron Distribution map. Fig. 3B.

#3 ZONE: #3 Zone mineralization is a concentration over old fault #4. It's western extremity is not known. It may extend directly west and join with the concentration of iron at the intersections of Section 50 and 20+00W. On the other hand this zone may also join with #2 Zone. The line of demarcation is shown on Fig. 3B as being along Section 52.

#4 ZONE: Is a small extension of #3 to the S.E. It is separated from #3 by an area of intrusives.

#5 ZONE: Is the zone lying astride the crest in the basement rocks on the western portion of the Ore Zone Arch. It is undoubtedly the down dip extension of #2 and #3 Zones and the concentration indicated at 64N on Section 2000W may represent the extension of the #1 Zone buildup. For purposes of description the line of demarcation between #5 and #'s 1, 2 and 3 Zones is indicated by the gap shown on Fig. 3B.

## DESCRIPTION OF #1 ZONE

The mineralization consists of a series of beds of limestone (?) and skarn that have been selectively replaced by magnetite. The beds are separated by layers of mottled porphyry that appear to be remarkably concordant with the mineralized beds. The main mineral concentration is within the eastern portion of the zone where the beds occupy a trough-like depression trending from 200W on Section 66 to 500 West on Section 74. (Overlying Fault #32.) The depression then swings to the NE, crosses Section 80 at 200 West and extends to Section 86 at 250 East. See Fig. 3B. The NE trend to the mineral concentration is no doubt due to the channelling effect of the underlying old fault #1 which is known to extend from Section 86 at 400E to 11+50 West on Section 72.

Outcrop Trend - N10W

Strike - (a) Whole Zone: Average N60°E. Dip 20-30 NW.

(b) Component Mineral Zones & Lenses may vary in strike and dip.

(c) Strike N60°E Dip 5°SE indicating trough feature at 84N200E.

(d) Strikes NW Dip 10SW @ 200 W on Section 68.

Rake - The intersection of the faults with the Older Volcanic surface constitutes a rake control.

Shape - (a) Whole Zone: modified sheet with pinch and swell structure: whole zone is composed of coalescing and splaying component horizons.

(b) Component Horizons: (or Component Beds) are Sheet-like to Tabular; gradual lensing: intercalated with Mottled Porphyry as sills or beds.

Splaying to NW. Some cross-cutting mineralization.

Mineralization - Magnetite: mainly fine grained. Some medium grain: coarse grain rare: selective replacement of certain beds (presumably Kunga limestones). Replacement textures common: mineralization from disseminated to massive. Average mineralization within zone about 50-60% Magnetite.

Pyrite: Average 3 to 5%: mainly as disseminated grains in magnetite but occasionally patchy up to 20% of mineralization: some as stringers. Pyrite appears to be most concentrated in areas near faults, usually post ore faults. (associated with silicification).

Accessory Minerals - Traces of Chalcopyrite and Pyrrhotite: occasional patch sphalerite.

Size - Within Ore Reserve Area only: Strike Length: 1700 feet. 1100 W Section 70 to 400 E on Section 88.

Width: Down Dip: 1300 feet from 100 W Sect. 62 to 700 W Sect. 86.

Limits: Indicated on Fig. 3B.

Thickness: Variable: average thickness of total zone (including center waste beds, etc.) is approximately 130-150 feet.

Mineralization Type - Selective replacement of certain beds and of skarns. Some disseminated and stringer type.

Ore Reserves - See "Ore Reserves." Area included in reserves is outlined in red on Fig. 3B.

References - (a) 400 Scale Sections appended to this report.

(b) 50 & 100 scale sections.

(c) 50 & 100 scale plans at 50' intervals through the zones.

Open - The zone is open to the SW on Sections 72, 74 and 76.

Internal Waste - Dykes make up about 20% of the total volume (of the Ore Reserve). Mottled Porphyry and skarn make up another 25%.

Total Internal Waste 45%.

## DESCRIPTION OF #2 ZONE

The #1 Zone mineralization extends to the south and coalesces with the #2 Zone which differs from the #1 mineralization by having a small amount of copper. The main mineral concentration is in limestones over the NW trending fault #3. The ore control was apparently very strong and the mineralization is generally more massive than in #1 Zone. The mineralization in the component beds tends to coalesce in the vicinity of the fault (cross cutting). It is apparent that much of the movement on the fault took place prior to the deposition of the Kunga formation, but some offsetting of the beds indicates that the fault was also active after the Kunga was deposited, but prior to the mineralization. Folding may have taken place over the fault scarp and may also be an ore control.

See Sections 44 to 68.

Outcrop Trend - WNW.

Trend of Mineralization - WNW

Strike - Over fault strikes are NW to N-S but away from fault strikes are N70E.

Dips over fault are 30° SW to E-W but away from fault dips are 20-30 NW.

Rake - The intersection of the NW trending fault with the volcanic surface constitutes a rake control. WNW.

Control Structure - The limestones probably lapped against the fault surface which locally affected the sedimentary trends. Possible folding over the fault scarp. Fault strikes NW and dips 70° SW: considerable pre-ore fracturing and faulting of Kunga limestones?

Shape & Component Horizons - A thick buildup of mineralization over the fault scarp with fading away from the control. The mineralization tends to follow certain beds away from the fault line and the upper beds fade first, whereas the mineralization following the lower beds (at the contact with the older volcanics) goes for considerable distance before fading. (400 feet ± down dip).

Mineralization - Magnetite: mainly fine grained: some medium grain. Mineralization generally massive: average mineralization within zone indicated by Reserve Sections 60-70% magnetite.

Type: selective replacement of certain beds and of skarn. Crosscutting in area of major fault control.

Pyrite: Average 2 to 3%. Mainly as disseminated grains in magnetite but occasional stringers. Some pyrite associated with silicification near post ore faults.

Chalcopyrite: An accessory mineral in the #2 Zone, but seldom as concentrations. Average less than 1/2 of 1% chalcopyrite, mainly as fine dissemination.

Pyrrhotite: More pyrrhotite than in #1 Zone. Up to 1% of total mineralization, usually as patches near base of ore zone.

Accessory Minerals - Sphalerite, occasional patch.

Size - Within area indicated for Ore Reserve Only - Length along trend 1400 feet.

Width: about 500 feet.

Thickness - Over fault - 200 to 300 feet: main bed to west of fault is

80 feet thick at 500 W on Section 54 Open

35 feet thick at 600 W on Section 56 Open

100 feet ? thick at 700 W on Section 60 Open

20 feet thick at 1100 W on Section 66 Open

Ore Reserves - See "Ore Reserves" area included in Reserves is outlined in red on Fig. 3B.

Open - The Zone is open to the west from Section 54 to Section 66.

Internal Waste - Dykes make up 25-30% of volume of Ore Reserve. Mottled Porphyry makes up another 10-15%. Total Internal Waste about (35-40%).

DESCRIPTION OF ZONE #3

See Sections 21-36 (100 Scale) and Ore Reserve Sections.

Outcrop Trend - NNW

Trend of Mineralization - WNW

Strike - over fault #4 is more or less NW, but away from fault strikes are N30E.

Dips - Dips over fault are more or less SW 20 to 30 but away from fault dips are 20 - 30 NW.

Rake - The intersection of the NW trending fault with the volcanic surface constitutes a rake control. The fault is thought to dip 60 to 70 to the SW.

Control Structure - The limestones probably lapped against the fault surface which locally affected the sedimentary trends; probable folding over the fault scarp. Slumping over scarp also probable: fault strikes WNW and is thought to dip 60 to 70° to the SW: mineralization fades away from control structure (250 feet ± down dip): pre-ore fracturing over Ore Zone ??

Shape & Components - A thick buildup of mineralization over the fault scarp with fading away to the NE and SW away from the control fault. From

Section 21 to Section 28 the Zone is composed of two component beds that appear to be draped over the fault scarp in the basement. A fold structure is indicated. From Section 32 to Section 36 it appears that the zone is composed of three component mineralized horizons that seem to splay to the NW. The fold structure is also suggested here.

Mineralization - Magnetite: Mainly fine grained. Some medium grain (1 mm.) Selective replacement of certain beds: Some cross cutting mineralization over fault: Average mineralization within mineral horizons 70-80% magnetite: Some breccia replacement.

Chalcopyrite: Average of 2 to 3% chalcopyrite disseminated as small blebs and specks through the magnetite. Especially within the lower mineralized zones. Some zoning of the chalcopyrite content is evident.

Pyrrhotite: Possibly 1% of total mineralization. Usually as disseminations of small specks in magnetite or as patches of dissemination. Associated often with chalcopyrite concentrations.

Accessory Minerals - (a) Occasional patch of sphalerite

(b) Hematite rare.

Size - Within area indicated for Ore Reserve Only:

Length: Along mineralization trend 1200 feet.Section 21 to Section 36

Width: About 450 feet.

Thickness: Over fault Sections 21 to 28 about 150 to 200 feet.

Sections 30 to 36 mineralized zones splay. Total thickness whole zone 200 to 320 feet. (Total thickness mineral beds average 180 feet.)

Zone Open - On west of Section 26 - 30' Mineral Zone

On west of Section 30 - 220' Mineral Zone

On west of Section 36 - 80' Low Grade

Internal Waste - Dykes make up 15-20% of total volume of Ore Reserve:

Limestone makes up another 10-15%.

## DESCRIPTION OF ZONE #4

Several outcrops are known at 15500N 21100E: this mineralization is thought to represent the SE extension of the #3 Zone. It is apparently separated from the #3 Zone by a block of intrusives. Very little is known about this zone as it has not been drilled. (Drilling commencing presently.)

Outcrop Trend - NNW

Strike - Unknown. Probably same as #3 Zone: about N30E to N20E.

Dips - Unknown. " " " #3 " " 20-30 NW.

Trend of Mineralization - WNW? Fading to SW?

Control Structure - #4 Fault?: limestone contact.

Shape - Sheet-like: following limestone. Volcanics contact. Fading to SW.

Mineralization - As in #3 Zone: magnetite (quite massive) with disseminated chalcopyrite. Quantity unknown.

Size - Unknown but probably small.

Length - along outcrop trend

Width - unknown

Thickness - 15-20 feet at outcrop: see surface Geology Map Fig. 3C.

Zone Open - To WNW.

Internal Waste - Unknown

Remarks - If #4 Zone copper tenor is high the zone may provide a small tonnage that might possibly be mined by stoping: if #4 fault (#3 Zone Fault)

Is the structural control then the zone will probably be small. It is possible, though, that the control is another fault. Under this circumstance the zone might swell down dip. (Considered unlikely.)

DESCRIPTION OF #5 ZONE

#5 Zone is the ore zone lying astride the crest in the basement rocks on the western portion of the Ore Zone Arch. A large portion of this zone has a footwall of diorite. The zone connects with the 1-2 Zone mineralization and undoubtedly also connects with the #3 Zone mineralization. Arbitrary lines of demarcation are indicated on the Iron Distribution Map, Fig. 3B. Information about this zone is scanty. Drilling to date has been done mainly only on a 500-foot grid.

Outcrop Trend - Outcrops only at (16900N 17700E). No trend. Otherwise blind.

Control Structure - The relationship of the mineralization to the Ore Zone is indicated on Fig. 3B. The arch may also be seen on Sections 25W, 20W, 15W and 10W. The eastern portion of the structure appears to be floored with diorite. This diorite also probably underlies the greenstones under Zones 1, 2 and 3: it is considered probable that the #1, #2 and #4 faults all extend into the area of the arch. The crest of the arch trends EW and plunges 20°W.

Shape - An arched sheet-like structure immediately superimposed over older volcanics or diorite. To the north of the crest of the arch the zone splays into two or three components: pinch and swell structure.

Strike - Strikes are apparently more or less parallel to the basement surface

(See Fig. 3A: also see Sequence of Events: Sec. (i) Folding and Faulting) To the north of the crest the sediments apparently strike NE to N60E and dip 30-45° to the NW. (At extreme NW corner strikes may be EW, dip 30N.) To the south of the crest strikes are more or less NW and dips 30° or more SW.

Size - Within limits indicated by 20 unit contour of Equal Iron Distribution Contour Map, Fig. 3B. Area is only roughly delineated by drilling.

Thickness - Variable: about 100 feet or more along Section 20W but thinner on Section 15W and on Section 25W. Intersection at T-322 on (Sect. 15W - Sect. 60) may be thicker than shown. See Sections 1" - 400'.

Faulting - Very little is known about this but SW edge may be a fault trending N30W?

Mineralization - South of crest much like #3 Zone but lower copper content. North of crest much like #2 Zone mineralization.

Zone Open - To north - thin beds splaying

To SW - Section 20W at Section 50 - 120' thick at depth

Section 15W at Section 50 - 70' thick at depth

Very little known about southwestern extremity.

Internal Waste - Sampling inadequate to determine amount of waste. (Probably about the same amount as in #2 Zone. Dykes 20%. Limestone and mottled porphyry and skarn 20%.)

Copper Content - Information is scanty but the copper content is apparently concentrated south of the axis of the Ore Zone Arch. (Extension of the #3 Zone probable.) Grade probably intermediate between 3 and 2 Zones.

<u>POST ORE FAULTING</u> - (1) Contact Creek Fault: Post Ore: Follows Contact Creek N-S. Dips 85° to East. East Side Down: Offset unknown.

(2) NE corner of #1 Zone is truncated by fault striking NW and dipping 80 to 85° NE. Movement south side west. Mainly a wrench movement but South side up. (The #1 East Offset Zone is the faulted extension remnant of #1 Zone.)

(3) NW Faults. A series with variable dips cut the #1 and #2 Zones. Minor offsets. Usually south side west. South side up in #1 and #2 Zones.

(4) N20°E fault? The SE corner of the #2 Zone may be offset to the south by a N20°E fault. A similar offset is seen in #3 Zone, (About 100 feet) but much of this is thought to be pre-ore.

(5) Probably some post ore movement along fault #3. (#2 Zone fault.) Offsets unknown.

## ORE RESERVES

**#1 ZONE** - For this reserve figure the #1 Zone was taken as from Section 68 to Section 90 inclusive.

| PANEL | Fe GRADE | VOLUME | |
|---|---|---|---|
| 68 - 70 | 36.35 | 11,605,000 $ft.^3$ | |
| 70 - 72 | 36.66 | 9,757,500 $ft.^3$ | |
| 72 - 74 | 37.41 | 8,985,000 $ft.^3$ | |
| 74 - 76 | 38.47 | 9,660,000 $ft.^3$ | |
| 76 - 78 | 39.20 | 8,642,500 $ft.^3$ | |
| 78 - 80 | 38.94 | 8,565,000 $ft.^3$ | |
| 80 - 82 | 40.97 | 9,587,500 $ft.^3$ | |
| 82 - 84 | 43.85 | 10,102,500 $ft.^3$ | |
| 84 - 86 | 43.52 | 8,502,500 $ft.^3$ | |
| 86 - 88 | 42.08 | 5,292,500 $ft.^3$ | |
| 88 - 90 | 41.31 | 2,205,000 $ft.^3$ | |
| 10,557,386 | 39.60 | 92,905,000 $ft.^3$ | Tonnage Factor 8.8 |
| Metric Tons | | 10,557,000 tons | |

## ORE RESERVES

**#2 ZONE** - For this reserve figure the #2 Zone was taken from Section 46 to Section 68.

| PANEL | GRADE Fe | GRADE Cu | VOLUME | |
|---|---|---|---|---|
| 46 - 48 | 46.87 | 0.244 | 320,000 $ft^3$ | |
| 48 - 50 | 34.30 | 0.228 | 1,120,000 $ft^3$ | |
| 50 - 52 | 34.55 | 0.201 | 3,165,000 $ft^3$ | |
| 52 - 54 | 38.63 | 0.170 | 5,305,000 $ft^3$ | |
| 54 - 56 | 44.16 | 0.195 | 6,147,500 $ft^3$ | |
| 56 - 58 | 45.81 | 0.278 | 7,487,500 $ft^3$ | |
| 58 - 60 | 38.77 | 0.204 | 8,280,000 $ft^3$ | |
| 60 - 62 | 32.32 | 0.075 | 6,005,000 $ft^3$ | |
| 62 - 64 | 32.72 | 0.083 | 6,030,000 $ft^3$ | |
| 64 - 66 | 36.68 | 0.066 | 11,172,500 $ft^3$ | |
| 66 - 68 | 37.53 | 0.061 | 12,967,500 $ft^3$ | |
| 7,513,812 long tons | 38.10 | 0.137 | $\frac{68,000,000\ ft^3}{9.05}$ | Tonnage Factor 9.05 Long Tons |

Reported - 7,640,449 Metric Tons @ Factor 8.9

## ORE RESERVES

**#3 ZONE** - See Ore Reserve & Grade Sections - 100 Scale. Sections 21 to 36 and 44 to 90 Alternate Sections. Reserves indicated are taken within the area outlined in RED (Fig. 3B).

| PANEL | GRADE Fe | GRADE Cu | VOLUME | |
|---|---|---|---|---|
| 21 - 22 | 39.54 | 0.86 | 1,748,750 $ft^3$ | |
| 22 - 23 | 44.13 | 1.04 | 2,157,500 $ft^3$ | |
| 23 - 24 | 43.63 | 1.26 | 2,321,250 $ft^3$ | |
| 24 - 25 | 50.39 | 1.31 | 2,421,250 $ft^3$ | |
| 25 - 26 | 49.25 | 0.96 | 2,701,250 $ft^3$ | |
| 26 - 28 | 45.51 | 0.71 | 9,915,300 $ft^3$ | |
| 28 - 30 | 50.35 | 0.71 | 8,556,000 $ft^3$ | |
| 30 - 32 | 50.30 | 0.74 | 8,319,000 $ft^3$ | |
| 32 - 34 | 48.48 | 0.61 | 7,547,500 $ft^3$ | |
| 34 - 36 | 49.54 | 0.41 | 5,877,500 $ft^3$ | |
| | 47.64 | 0.82 | 51,565,300 $ft^3$ | Tonnage Factor 8.5 |

Reported $\frac{51,565,300}{8.4}$ = 6,138,726 Metric Tons @ 47.64% Fe 0.82% Cu

## SAMPLING:

### Methods:

Sampling for Reserve Calculations was done exclusively by diamond drilling. All mineral zones were sampled. In addition, five feet above and five feet below the zones were also sampled.

Core was broken into 2" to 2½" pieces and alternate pieces were taken so that 1/2 of the core constituted a sample. All material (including waste) within the reserve zone outlines were sampled.

Where possible, sample lengths were adjusted to correspond with mineralization or rock changes. Average length of sample was about 8 feet.

To outline and sample the ore zones the drilling was done on sections 100 feet apart with holes every 100 feet. Due to the large number of dykes it was found that the zones could not be delineated by this sampling alone. The extremely complex jumble of intrusives masked the outline and internal details of the mineral zones to such an extent that an adequate evaluation could not be made. As most of the dykes have steep dips it was found necessary to drill additional angle holes to intersect the intrusives.

### Projections:

Drilling and sampling have therefore been done in sufficient detail that errors of projection will not produce significant errors in delineation of the zones. Furthermore, the sampling is sufficiently adequate that projection errors will not produce significant error in the grade determinations.

In view of the geological complexity and in order to insure that projections were as accurate as possible all the necessary data was correlated by three dimensional methods by use of a plastic model. These projections have been used for the preparation of level plans at 50-foot intervals.

It should be noted that although sampling and projections are adequate for the outline and grade determination for the overall zones, they are hardly adequate for small block determinations where projection errors may become significant. (i.e. benches, etc.)

Assays:

All samples were assayed for acid soluble iron and for copper exceptfor the sampling on Sections 68 to 90 which was assayed solely for acid soluble iron.

Metallurgical Tests:

Representative bulk samples of diamond drill core were prepared for each zone. These were sent to Lakefield Research of Canada Ltd. for composite assaying, magnetic cobbing tests, Davis Tube Tests, recovery of iron and copper investigation, etc.

#1 Zone - 1800 lbs.

#2 Zone - 1150 lbs.

#3 Zone - 1000 lbs.

Method of Derivation of Ore Reserves:

Iron and copper grades were determined by sampling all material within the outlined ore zones. Samples were also taken for 5 feet above and 5 feet below the zone. Each assay was weighted for length and for specific gravity.

$$\text{Grade} = \frac{\sum \text{Assay values} \times \sum \text{Assay footages} \times \sum \text{S.G.'s for each assay}}{\sum \text{Assay footages} \times \sum \text{S.G.'s for each assay}}$$

Sampling interval was every 100 feet. Where additional holes increased the sampling (i.e. lessened the interval) the effect of oversampling was taken into consideration by combining averages to revert to the 100-foot interval. Areas were determined by planimetry of areas on each section. Each area was checked independently.

Tonnages indicated are metric tons. Tonnage volume factors are derived from specific gravities of calculated iron grades.

See Ore Reserve Sections 1" to 100' indicating outline of reserve as well as individual hole (intersection) averages for iron and copper grades.

## SURVEY

Due to the extreme complexity of the geology in the vicinity of the ore zones the need for detailed drilling and sampling necessitated an accurate control survey laid out in such a manner that information could be retained and used as a control for mining procedure. Furthermore, as normal methods of geological mapping proved ineffective it was found necessary to carry on an unusually detailed program of geological mapping. In order to tie this information in with drilling and sampling data an accurate ground survey was prerequisite.

### Method:

Transit-tape control traverses on the ground tied to a triangulation network: traverses were closed and balanced to the triangulation. Intermediate traverses were run to break up the main traverses: stations every 100 to 200 feet: stadia points were shot in from the traverse stations: over mineralized zones a stadia point every 50 to 60 feet: all stadia points picketed and flagged: elevations carried up hill by traverses but tied in to bench marks established by levelling.

### Base Line:

A base line was established by ground traverse on Horn Island. End points at NE (Sta. 1) and SW (Sta. 10) tips of island: back chained: no sag, temperature or tension corrections: Wild instrument: (Reads to 20")T-16: elevations carried by vertical angles.

<u>Base Line Check</u>: Re-surveyed: single taping: triangulation to $\Delta$D (at camp point) and to Seal Rock $\Delta$ 21. From $\Delta$ D and $\Delta$ 21 triangulated points 1A and 10A, established near $\Delta$ 1 and $\Delta$ 10 respectively. Distance $\Delta$1 to $\Delta$10 calculated from triangulation and by tying in $\Delta$1 and $\Delta$ 10 to Base Line traverse on ground: difference between calculated and surveyed Base is 0.21: difference in azimuth 4'': base line accuracy 1:8500: additional ties with government hydrographic stations in the harbour are good, indicating an adequate base line: base line end points permanent in rock.

<u>Triangulation</u>: By Wild T-16 (Reads 20''): each angle read four times upright and plunged: points set in rock: triangulation net with points on islands in harbour and on shore: net carried to triangulation points on or near mineralised zones: traversing on ground between points.

<u>Levelling</u>: Elevations have been established on the hill by double levelling with Wild precise Level: main levelling traverse along the present access road from Hydrographic bench mark #4 to triangulation point 15 (Core Shack) to triangulation point 14 (#3 Zone at Adit).

Distance 7400 feet: difference in levels up and down 0.048: elevation difference about 1200 feet.

Bench marks have been set in the rock along the road levelling route.

<u>Traversing</u>: Hubs every 150-200 feet: some points in rock: main traverses back chained: readings to minutes or better: angles read up and plunged: vertical angles carried: traverses closed and balanced.

| | | | | | | |
|---|---|---|---|---|---|---|
| #1 Zone | - 16 | traverses | - distance | 24,034.63 | - 1:3117 |
| #2,3,4 Zones | - 34 | " | - " | 35,282.11 | - 1:2700 |
| #5 Zone | - 18 | " | - " | 19,389.70 | - 1:2366 |
| | 68 | traverses | | 78,706.44 feet, | average 1:2752 |

Lineal Tolerance $0.04 \sqrt{D} + 0.20$

Angular Tolerance $1.5 \sqrt{N}$ where N is reading in minutes: (1.5 Mountain Factor).

Stadia Points: Approximately 15,000: numbered stakes: flagged with coloured tape. These points comprise the control survey for contouring, geological mapping and magnetometer.

Road Traverse: The main control traverse is the road traverse from camp to #3 Zone adit: run as a check on previous work and for balancing: has been balanced to Δ 15 ('Core Shack) and Δ 14 (Upper Adit).

Balancing: Peripheral traverses around area covered balanced to triangulation and levelling control points: control tie points balanced by working inwards: various traverses leading to same tie point are weighted according to the number of instrument set-ups: balancing same for elevations.

MAGNETOMETER SURVEY

Method: Using a Sharpe A-3 magnetometer individual readings were taken by null method at each ground traverse station or stadia point. Over the mineralized zones these points average 50 feet apart. Background was established as 57,400 gammas. (See Magnetometer Survey Plan, Scale 1" - 400 ', Figure 3D.) Readings indicated on the map are in thousands of gammas above or below background (contouring factor is 100) where background (57400 g.) is indicated as zero.

Results: Where magnetite mineralization comes to surface the magnetic intensity is generally over 10,000 gammas above background. The anomalies are sharply defined and in shape they closely approximate the outcrop pattern. The effect of topography as compared to structure is well indicated. Highs (above background) are compensated by lows (below background) with the 0 contour (background 57400 gammas = 0) being located at or close to the footwall contact of the mineralization. The "lows" occur as a rule topographically below the mineralization. Where mineralization occurs at surface the changeover from high to low is remarkably sharp.

Within #1 and #2 Zones several areas consisting mainly of waste within the ore zone are indicated by "lows". (See Fig. 3D and compare with Geological Plan Fig. 3C and with Iron Distribution Contour Plan Fig. 3B.)

The most important point indicated by the survey is that a sheet-like mineralized zone (magnetite) at depth is indicated by a very low "positive" anomaly.

At Tasu the extensive #5 Zone is indicated at surface usually by an anomaly of only 1000 to 2000 gammas above background. (Again see Figures 3B, 3C, 3D.) An anomaly of 4000 to 5000 gammas is therefore indicative of considerable concentration at depth.

Magnetic profiles are indicated graphically for Sections 22, 26, 30, 34, 50, 60, 70, 80 and 88.

Contouring factor = 100 (Example: +100 on the graph = 100 x 100 = 10,000 gammas)

The effect of the ore zones dipping to the west is usually indicated by the shape of the profile curve. To the west of the outcrop area the profile of the curve is generally flatter than to the east of the outcrop.

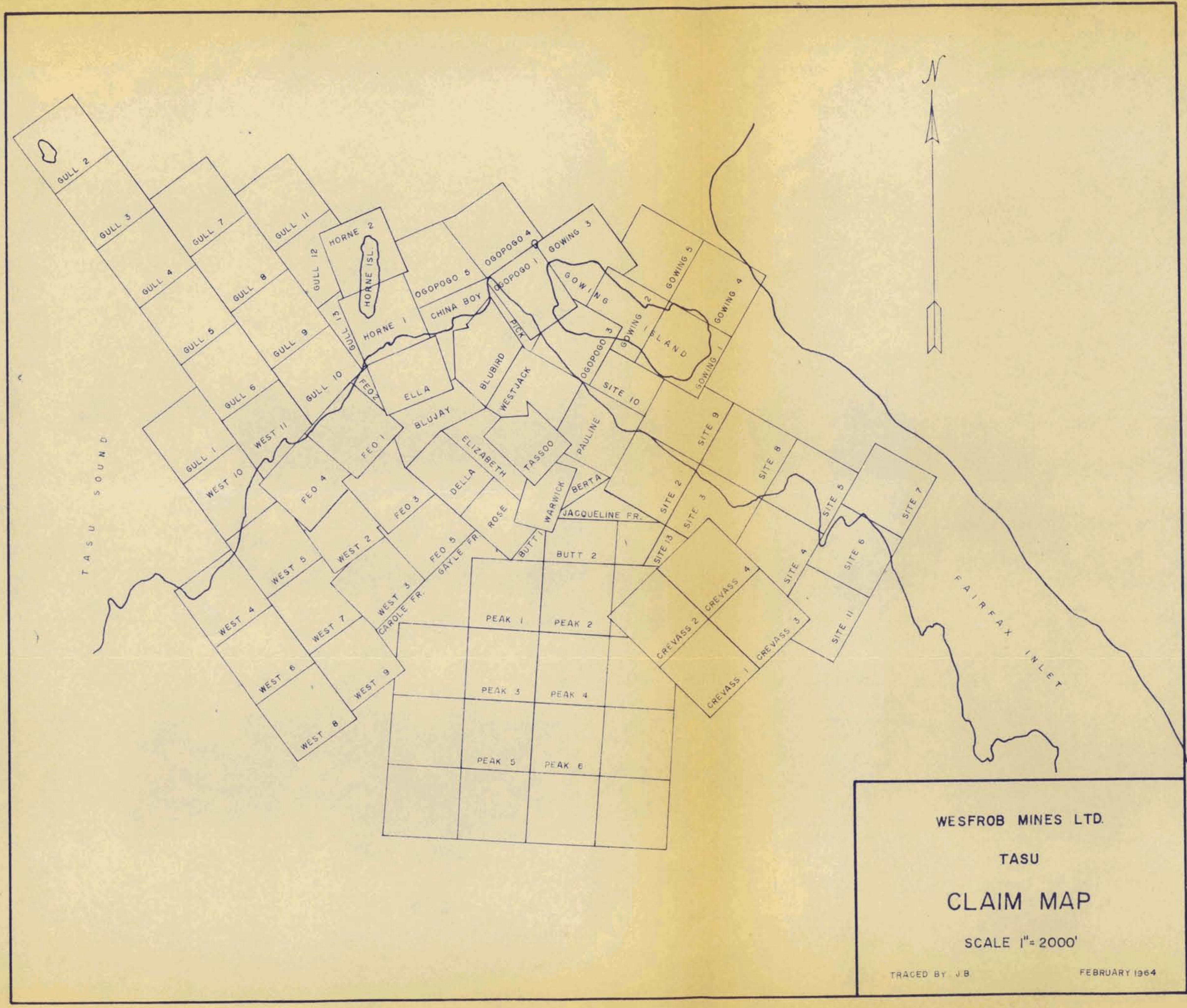
DIAMOND DRILLING

The diamond drilling done on the property to date is indicated by Table #3. Total to end of March, 1964 - 116,921 feet, of which 103,318 feet were with AX coring.

G K Polk

Vancouver, B. C.
April 10, 1964

G. K. Polk
Geologist




**WESFROB MINES LTD.**

**TASU**

# CLAIM MAP

SCALE 1" = 2000'

TRACED BY J.B. FEBRUARY 1964

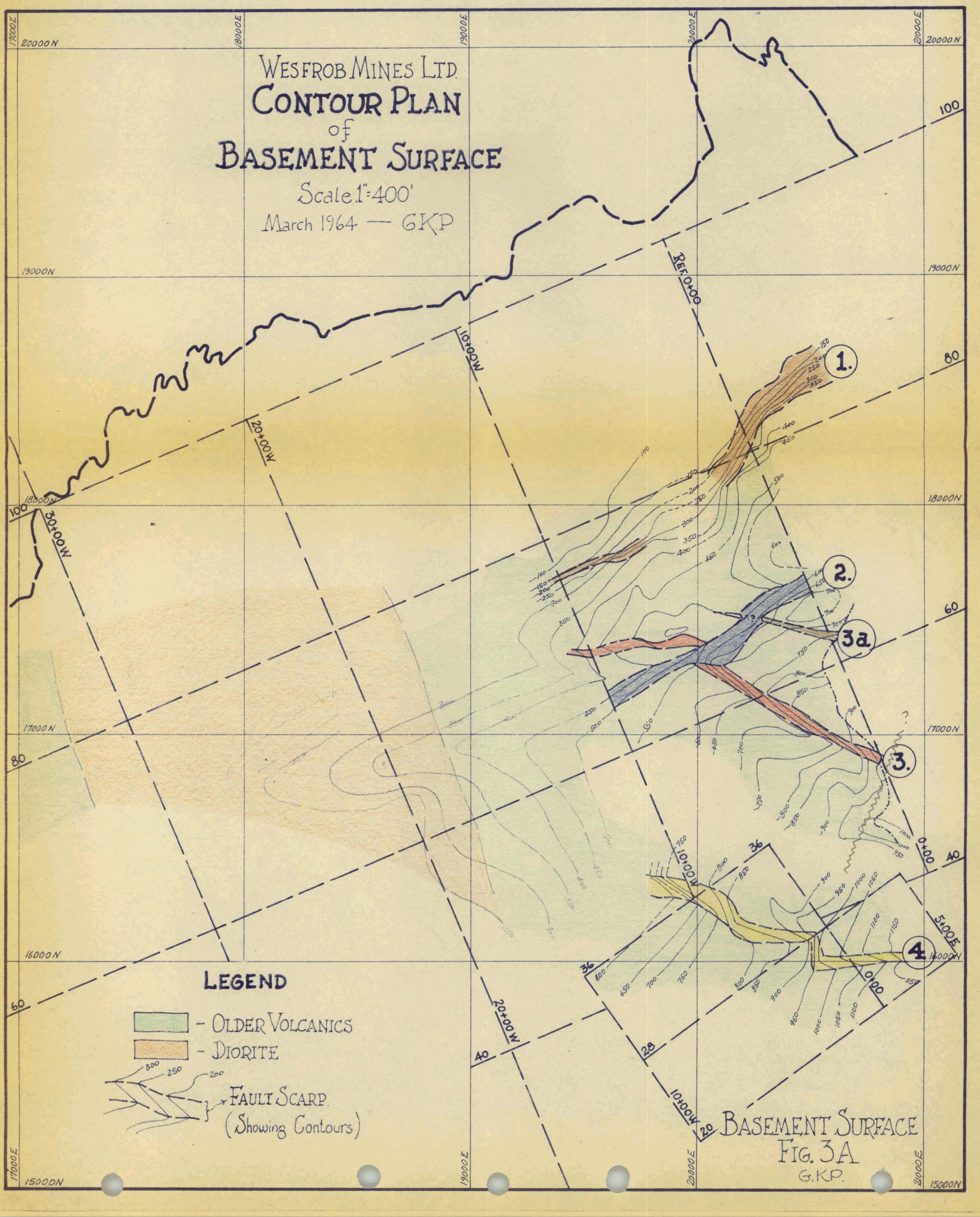
# WESFROB MINES LTD

## (TASU)

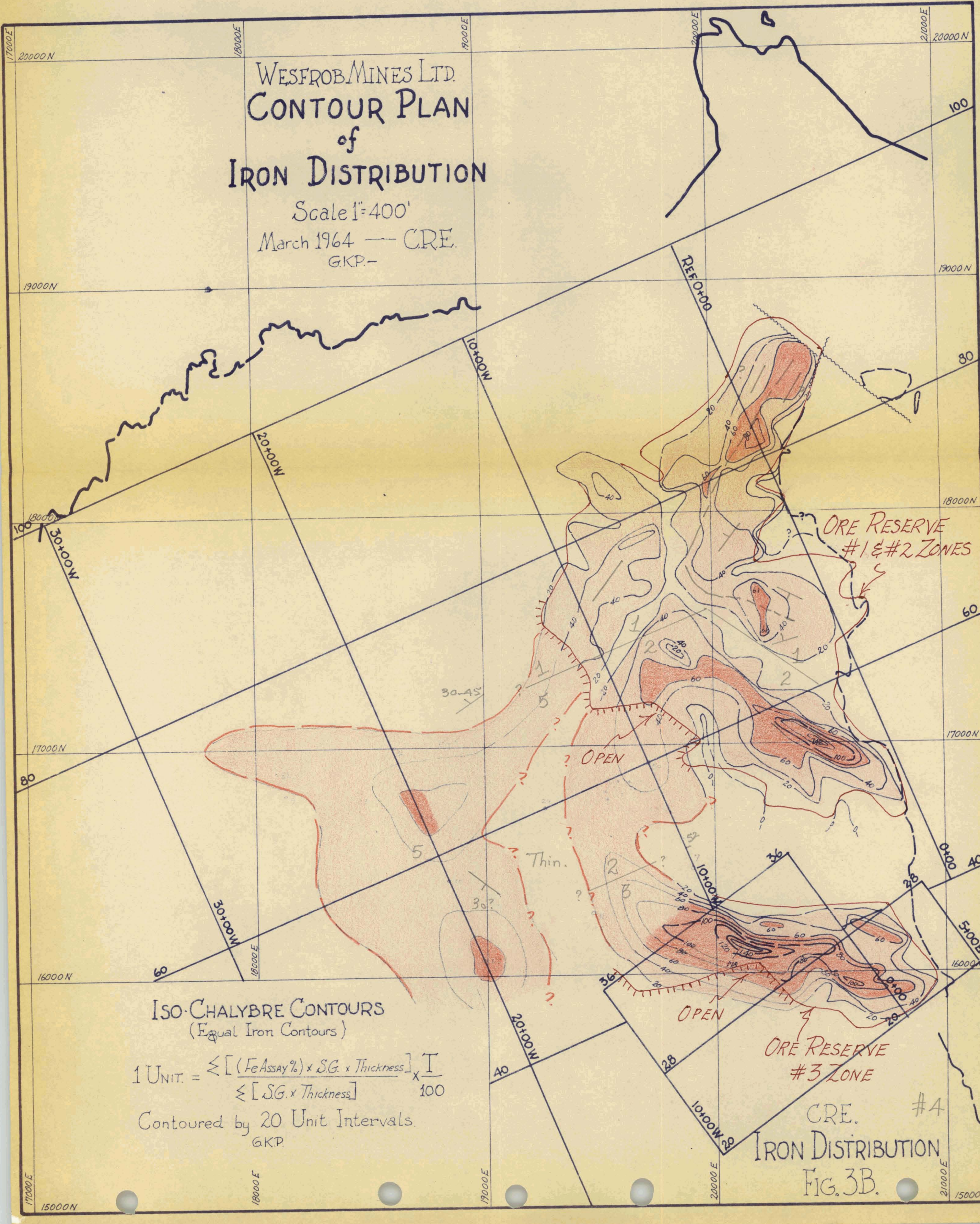
## LEGEND

| Group | Colour No. | Abbreviation | Rock Type | Remarks |
|---|---|---|---|---|
| VOLCANICS (Pre-Triassic) | 738 | GRST. | GREENSTONE | |
| | 738 ½ | F DK P. | FINE DARK PORPHYRY | ORIGIN UNCERTAIN |
| | 751 | MOT P | MOTTLED PORPHYRY | ORIGIN UNCERTAIN |
| | 738 | SM. | "SMOKEY" ANDESITE MARKER | |
| SEDIMENTS (Late Triassic) — KUNGA | 741 ½ | LST | LIMESTONE | |
| | 740 | DK LST. | DARK LIMESTONE | |
| | 734 ½ | PALE SEDS. | PALE SEDIMENTS | LIMESTONE VARIABLY ALTERED TO PYRITIC HORNFELS |
| | 747 ½ | DK. SEDS. | DARK SEDIMENTS | LIMESTONE VARIABLY ALTERED TO PYRITIC HORNFELS |
| | 741 ½ | ARG. | ARGILLITES | |
| INTRUSIVES (Oldest to Youngest) | 737 | G.P. | GREY PORPHYRY | |
| | 737 | DK G.P. | DARK GREY PORPHYRY | |
| | 737 | W. P. | WHITE PORPHYRY | |
| | 737 | DIO. | DIORITE (NORMAL) | |
| | 745 ½ | DIO. P. | DIORITE PORPHYRY | |
| | 756 | GAB ; BAS. | GABBRO ; BASALT | |
| MINERALIZATION | 744 | MAG. | MAGNETITE | |
| | 735 | SK. | SKARN | |

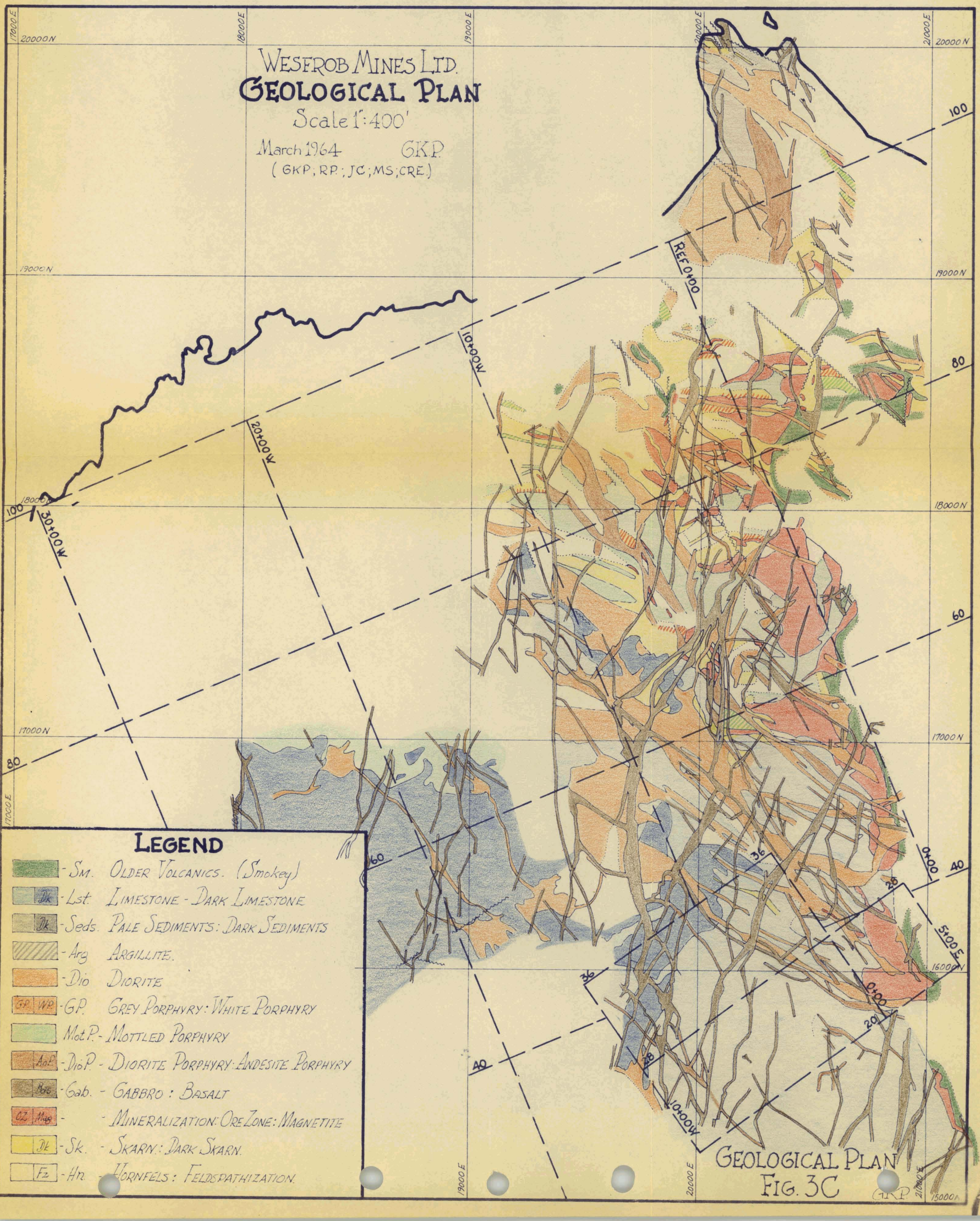
LEGEND



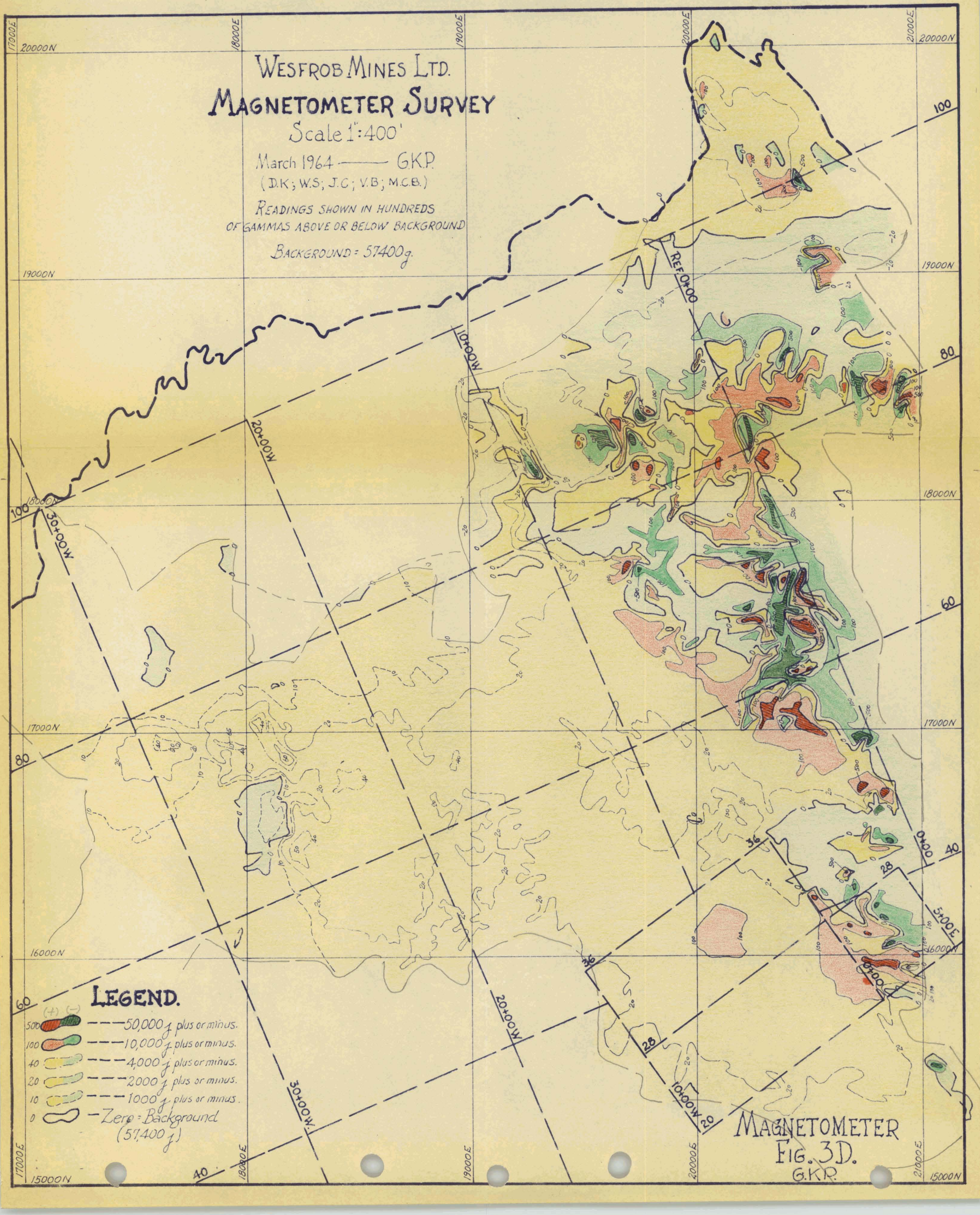
WESFROB MINES LTD.
CONTOUR PLAN
of
BASEMENT SURFACE
Scale 1"=400'
March 1964 — GKP
17000E
18000E
19000E
20000E
21000E
20000N
19000N
18000N
17000N
16000N
15000N
REF. 0+00
10+00W
20+00W
30+00W
0+00
5+00E
100
80
60
40
36
28
20
1.
2.
3.
3a
4.
LEGEND
- OLDER VOLCANICS
- DIORITE
300
250
200
FAULT SCARP
(Showing Contours)
BASEMENT SURFACE
FIG. 3A
G.K.P.



WESFROB MINES LTD.
CONTOUR PLAN
of
IRON DISTRIBUTION
Scale 1" = 400'
March 1964 —— C.R.E.
G.K.P.-
ISO-CHALYBRE CONTOURS
(Equal Iron Contours)
1 UNIT = Σ[(Fe Assay %) x S.G. x Thickness] / Σ[S.G. x Thickness] x T/100
Contoured by 20 Unit Intervals.
G.K.P.
ORE RESERVE
#1 & #2 ZONES
ORE RESERVE
#3 ZONE
OPEN
OPEN
Thin.
REF 0+00
10+00W
20+00W
30+00W
0+00
5+00E
17000E
18000E
19000E
20000E
21000E
20000N
19000N
18000N
17000N
16000N
15000N
C.R.E.
IRON DISTRIBUTION
FIG. 3B.
#4

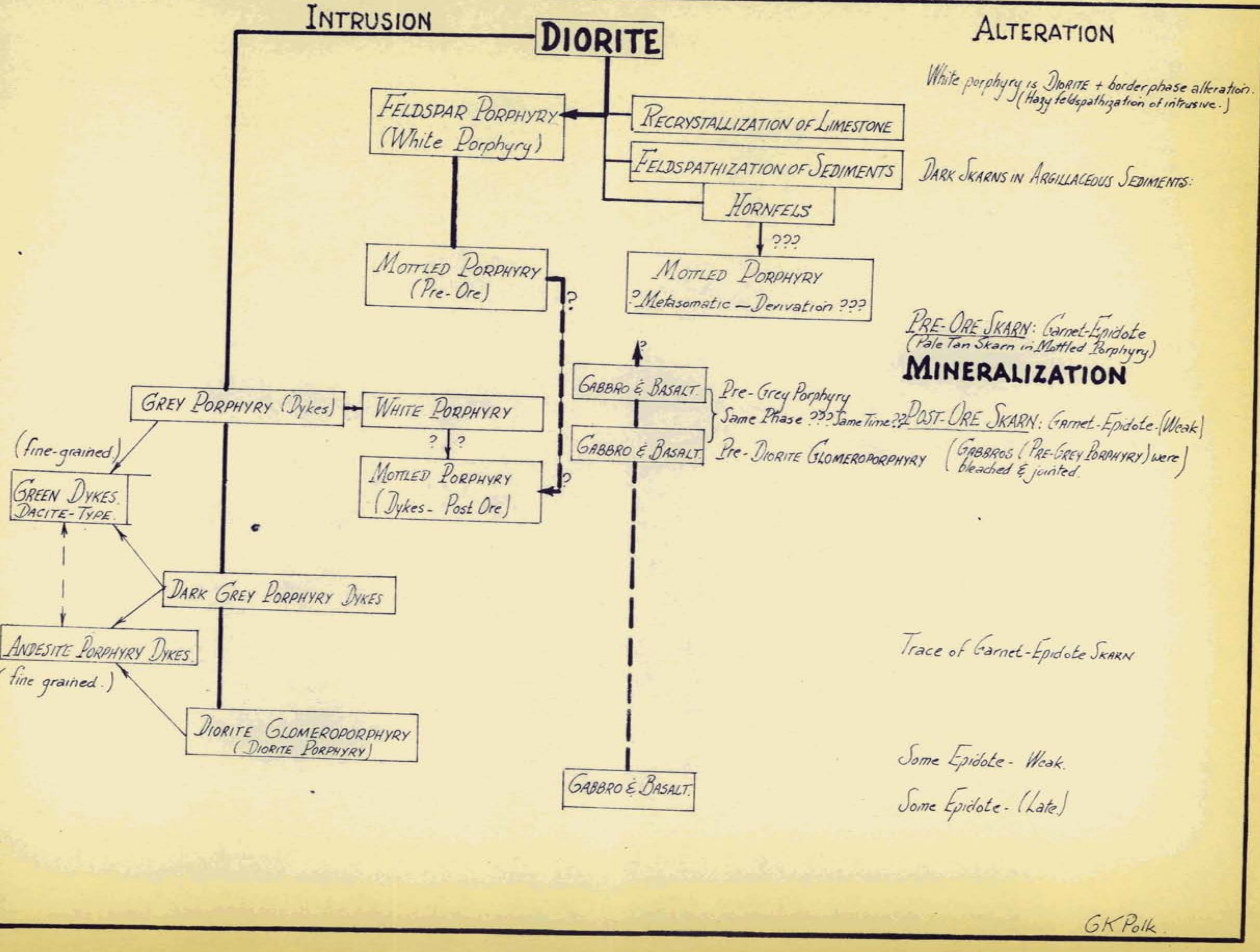



GEOLOGICAL PLAN
FIG. 3C



WESFROB MINES LTD.
MAGNETOMETER SURVEY
Scale 1":400'
March 1964 ——— G.K.P.
(D.K; W.S; J.C; V.B; M.C.B.)
READINGS SHOWN IN HUNDREDS
OF GAMMAS ABOVE OR BELOW BACKGROUND
BACKGROUND = 57400g.
LEGEND.
(+) (-)
500 ———50,000 γ plus or minus.
100 ———10,000 γ plus or minus.
40 ———4,000 γ plus or minus.
20 ———2000 γ plus or minus.
10 ———1000 γ plus or minus.
0 —Zero = Background (57,400 γ)
MAGNETOMETER
FIG. 3D.
G.K.P.
17000E
18000E
19000E
20000E
21000E
20000N
19000N
18000N
17000N
16000N
15000N
REF. 0+00
10+00W
20+00W
30+00W
5+00E
0+00
100
80
60
40
36
28
20

TABLE 1



INTRUSION
DIORITE
ALTERATION
White porphyry is DIORITE + border phase alteration. (Hazy feldspathization of intrusive.)
FELDSPAR PORPHYRY (White Porphyry)
RECRYSTALLIZATION OF LIMESTONE
FELDSPATHIZATION OF SEDIMENTS
DARK SKARNS IN ARGILLACEOUS SEDIMENTS:
HORNFELS
???
MOTTLED PORPHYRY (Pre-Ore)
?
MOTTLED PORPHYRY
? Metasomatic — Derivation ???
PRE-ORE SKARN: Garnet-Epidote
(Pale Tan Skarn in Mottled Porphyry)
MINERALIZATION
?
GABBRO & BASALT.
Pre-Grey Porphyry
Same Phase ??? Same Time??
POST-ORE SKARN: Garnet-Epidote-(Weak)
GREY PORPHYRY (Dykes)
WHITE PORPHYRY
? ?
GABBRO & BASALT.
Pre-DIORITE GLOMEROPORPHYRY
(GABBROS (PRE-GREY PORPHYRY) were bleached & jointed.)
(fine-grained.)
GREEN DYKES. DACITE-TYPE.
MOTTLED PORPHYRY (Dykes - Post Ore)
?
DARK GREY PORPHYRY DYKES
ANDESITE PORPHYRY DYKES.
(fine grained.)
Trace of Garnet-Epidote SKARN
DIORITE GLOMEROPORPHYRY (DIORITE PORPHYRY)
Some Epidote - Weak.
GABBRO & BASALT.
Some Epidote - (Late)
GK Polk

| Age | Activity | Product | Evidence of Relative Age | | Alteration & Rock Sequence |
|---|---|---|---|---|---|
| Late Paleozoic or Early Upper Triassic | Andesitic Volcanism | Older Volcanics Karmutsen Fm | Greenstones: Underlies all sediments. | Cut by all intrusives: Generally the footwall for mineralization | Regional alteration to greenstone. |
| | Folding & Faulting | Arching & Faults: 1st phase of San Cristoval Diorite Intrusion | | | |
| | Erosion (Minor) | Minor Disconformity: Fault scarps modified & fault-line valleys formed | Modified fault-scarps & valley forms apparently pre-Kunga: In places beds of Kunga lap against older volcanics. | | |
| Upper Triassic ① Karnian ② Karnian-Norian ③ Norian-Early Jurassic (Sinemurian) | Sedimentation | Kunga Fm: ① Base: — Massive Grey Limestone ② Lower Center: Thin Bedded Black Limestone ③ Top: Argillites & Argillaceous Limestone | Overlies older volcanics: ① Karnian Ammonites ② Monotis: Halobia: ③ Arniocerated Ammonites | Some slumping in Kunga over scarps & valleys in Older Volcanics: Slumping contemporaneous with deposition & (?) with folding. Older faults active during deposition. | |
| Lower Jurassic (Pleinsbachian) (Toarcian) | Sedimentation | Maude Fm: Grey Shale: Blocky dark grey Argillite; Calcareous shale; Greenish grey sandstone. | Harpoceras, Fanninoceras, Leptaleoceras | Conformable with Kunga: Missing at Tasu: | |
| Middle Jurassic (Callovian-Bajocian) | Andesitic Volcanism | Yakoun Fm (a) Base: Calcite cemented scoriaceous lapilli-tuff. (b) Bottom Member: Shale & Sandstone (c) Center Member: Porphyritic Andesite Agglomerate (d) Upper Members: Tuffs: Lapilli; Tuffaceous sandstones; Volcanic sandstone. | Stephanoceras & Chondroceras. | Conformable to slightly unconformable with the Maude Fm: Unconformable with Kunga. | |
| | Folding & Faulting | Ore Zone Anticline: EW to WNW plunges 20 W. Faulting: Continued on old fault lines | Age of fold uncertain. Faulting in limestones over scarps in Older Volcanics but offsets in limestone not nearly so great as those in basement (Indicated by magnitude of scarps in Older Volcanics.) | | |
| Late Jurassic — San Cristoval Batholith | Intrusion | Feldspar Porphyry: Mottled Porphyry Feldspathization | Mottled Porphyry & Feldspathization follow bedding in limestone & some in Older Volcanics: Some Mottled Porphyry intrusive as sills but some may be feldspathization. Limestones recrystallized. | | |
| | Emanation Effects | Pre-Ore Skarns (Garnet; Epidote; Chlorite; Amphibole; Calcite, Pyrite) | (a) Skarn replaces silty beds in limestone or (b) replaces limestone directly or (c) replaces Mottled Porphyry or Hornfels. | | |
| | | Mineralization (Magnetite; Pyrite; Chalcopyrite; Sphalerite) | (a) Selective replacement of certain silty limestone beds. (b) Replaces Skarn ① after Limestone ② after Silty Limy sediments ③ after Mottled Porphyry & Feldspathization ④ after Older Volcanics - (rare) (c) Direct replacement of Limestone breccia & Mottled Porphyry Breccia | | |
| | | Old Gabbro Dykes. | | | |
| | Intrusion | Grey Porphyry Dykes: Post ore. | Cut ore zone: Not mineralized. Larger masses usually altered to White porphyry: Grey porphyry grades to white porphyry. Grey porphyry as dyke swarms WNW to NW dips steep Generally 70° to SW or to NE. Rare skarn. Dykes are feldspathic but become more mafic as time goes on and grade into Dark Grey Porphyries. | | |
| | Emanation | Post Ore Skarns: Uncommon | Some skarn in White Porphyry dykes. | | |
| | | Dark Grey Porphyry Dykes: | More mafic phase of Grey Porphyry: Gradations indicate differentiation. | | |
| | | Diorite Glomeroporphyry Dykes: | Dykes NW dip 40 to 60 E: Cut Grey Porphyry & Dark Grey Porphyry dykes: Also grade into dark grey porphyry. | | |
| Tertiary | Intrusion. | Gabbro & Basalt Dykes | Swarms of Gabbro & Basalt dykes: Strike mainly N-S to N10E and dip 60-70° to the east. | | |

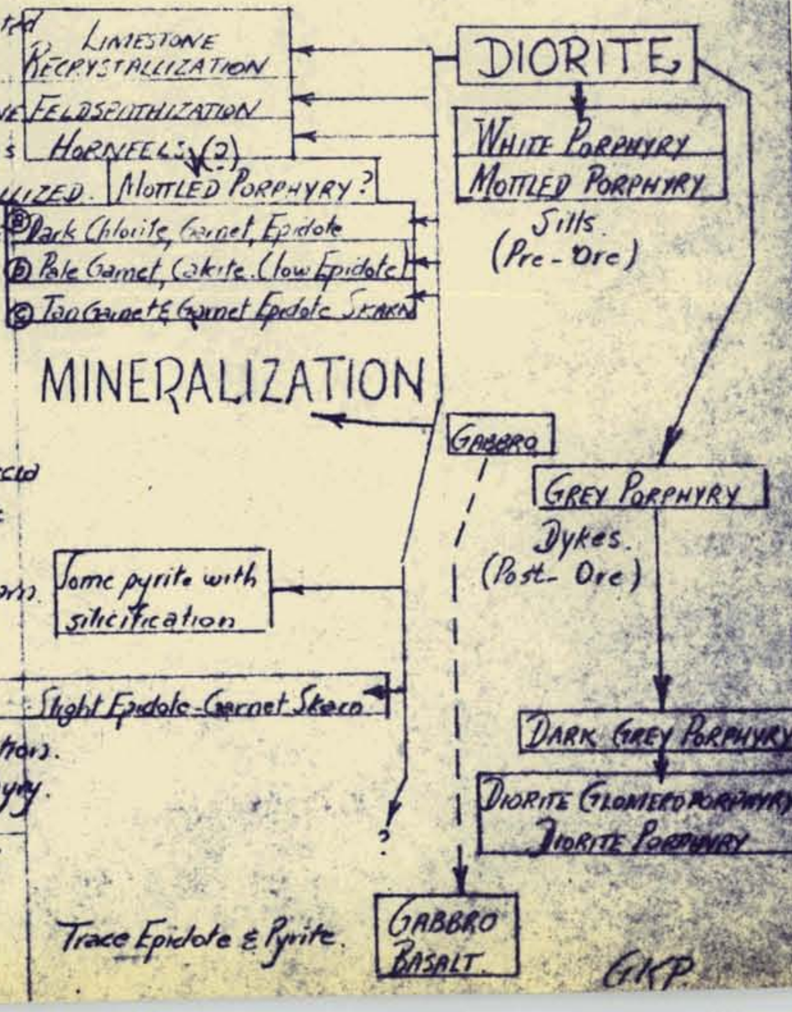



TABLE 12

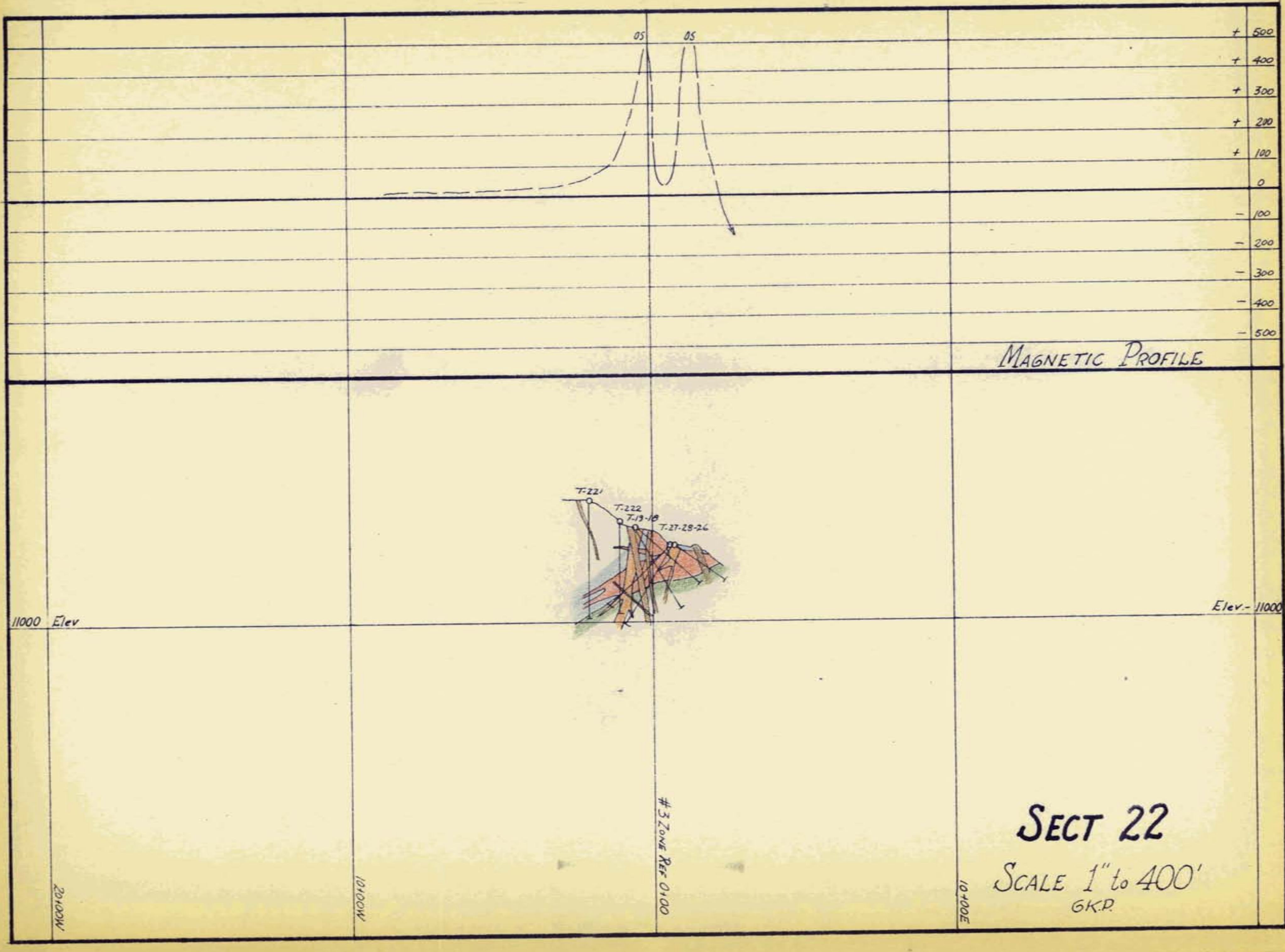
# Wesfrob Mines Ltd

## Drilling

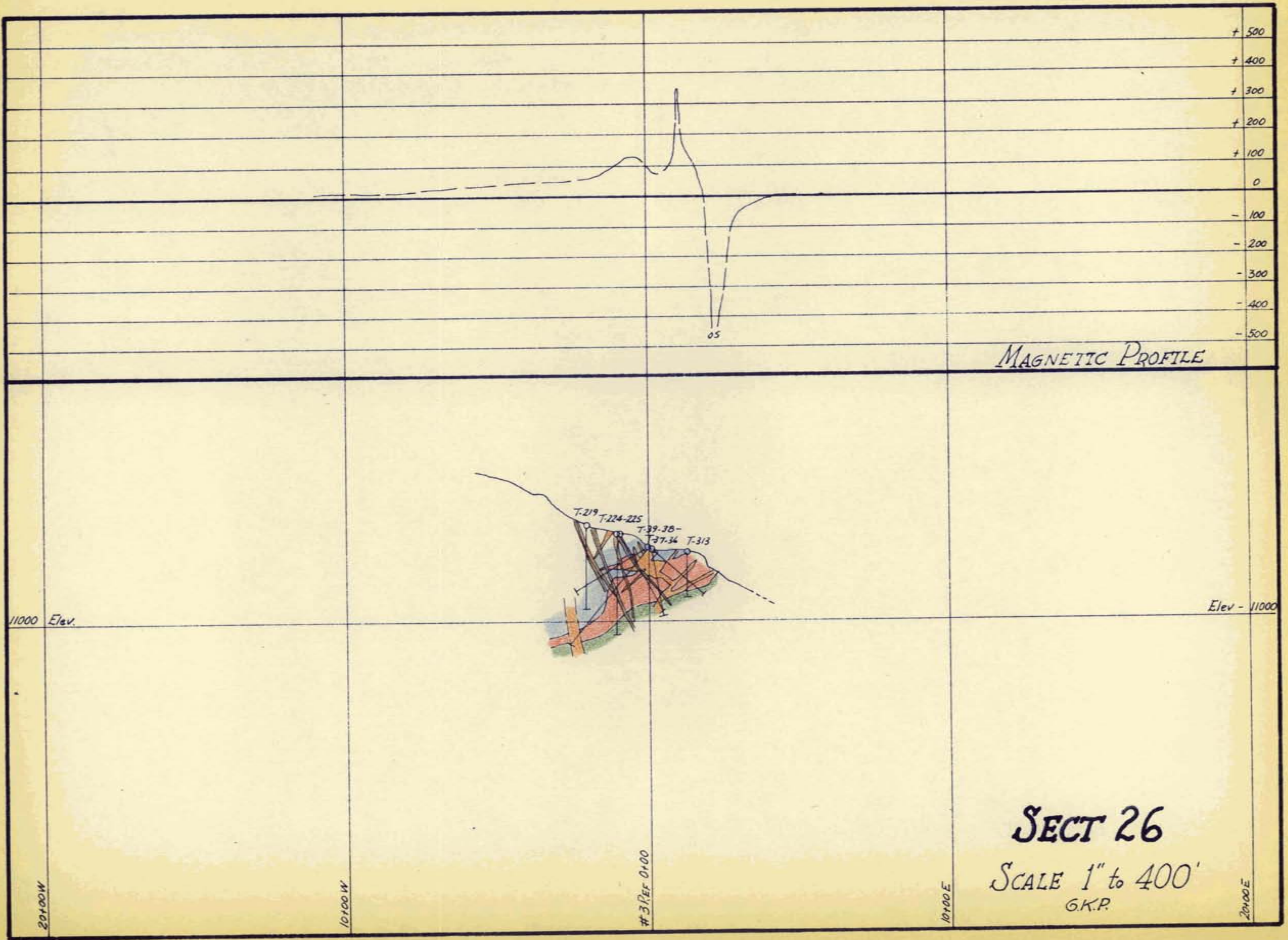
| Year | AX Holes | AX Feet | EX Holes | EX Feet | PS Holes | PS Feet |
|---|---|---|---|---|---|---|
| 1956 – 1957 | 55 | 14,908 (Av. 271) | 12 | 3447 (Av 287) | 82 | 3930 (Av 48) |
| 1961 | 32 | 10,429 (Av. 326) | | | 41 | 6,226 (Av 152) |
| 1962 | 115 | 36,588 (Av 318) | | | | |
| Jan.–May 1963 | 101 | 29,345 (Av 290.5) | | | | |
| Oct.–Dec. 1963 | 8 | 4,382 (Av. 548) | | | | |
| Jan.–Mar 1964 | 11 | 7,666 (Av 697) | | | | |
| **Totals** | 322 | Av 321<br>103318 | 12 | Av 287<br>3447 | 123 | Av 83<br>10156 |

457 Holes, 256 feet average depth, 116921 feet total.

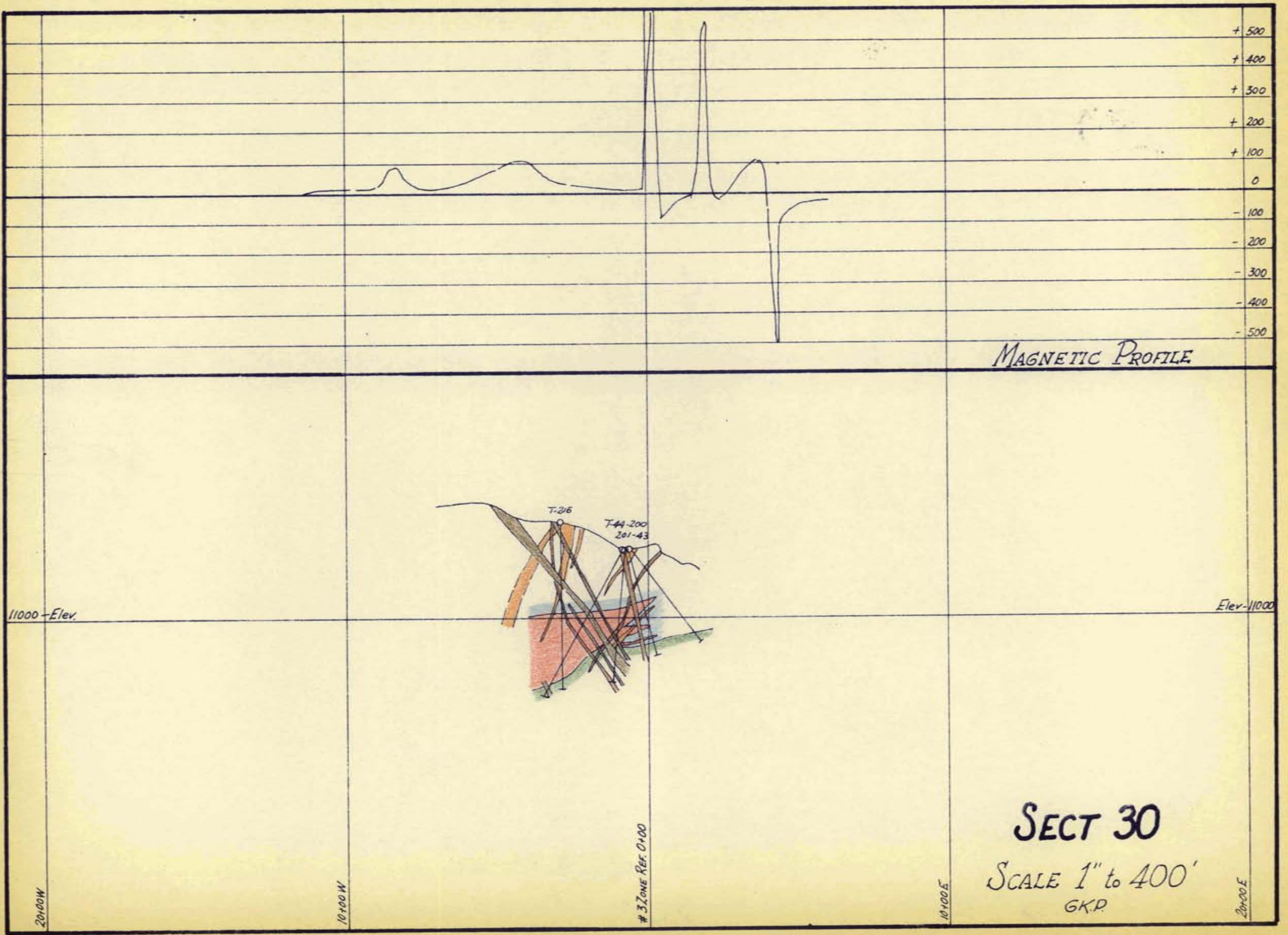
Table 3

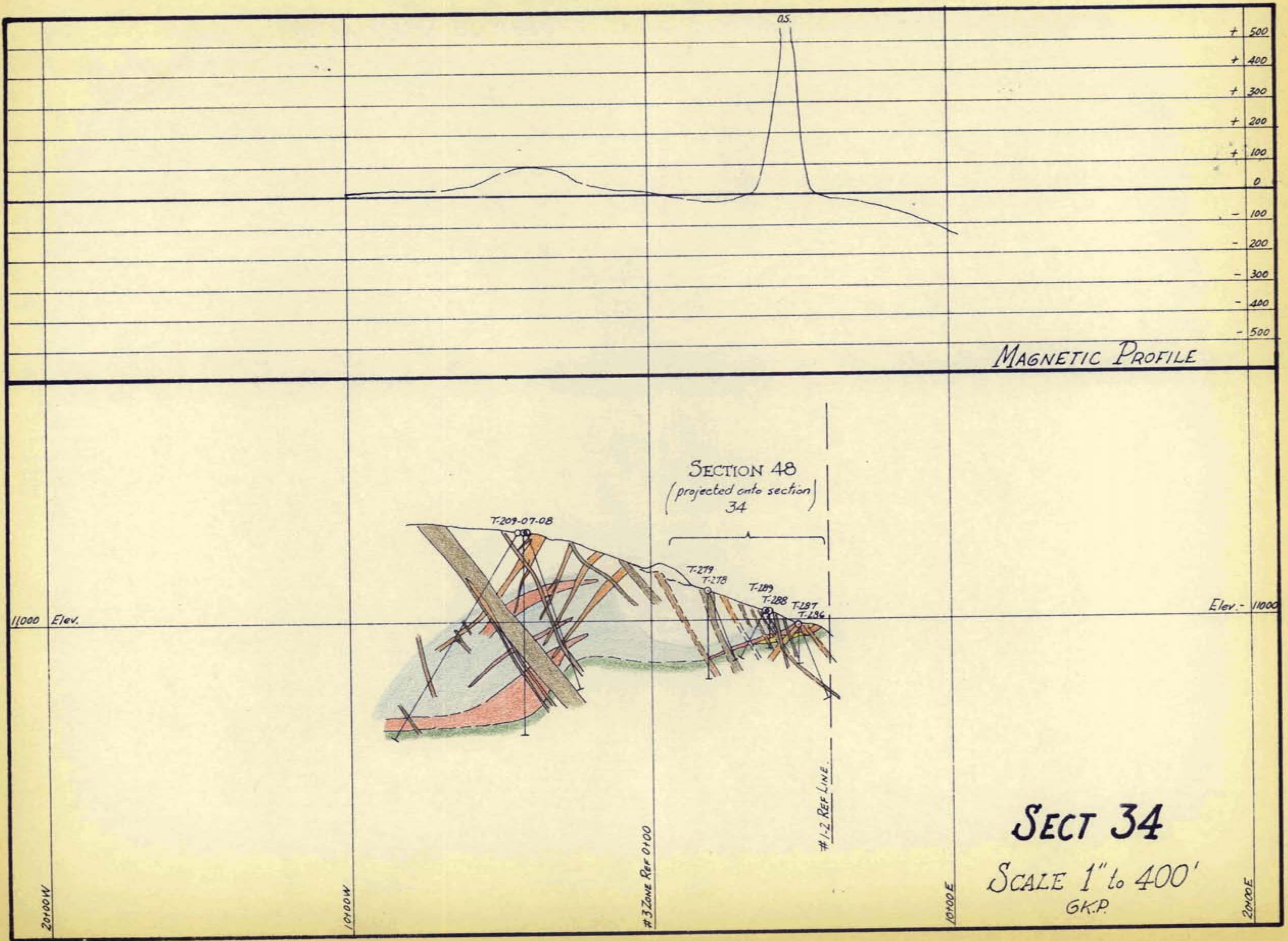


OS
OS
+ 500
+ 400
+ 300
+ 200
+ 100
0
– 100
– 200
– 300
– 400
– 500
MAGNETIC PROFILE
T-221
T-222
T-19-18
T-27-28-26
11000 Elev
Elev.- 11000
10200W
10100W
#3 ZONE REF 0+00
10+00E
SECT 22
SCALE 1" to 400'
GKP.

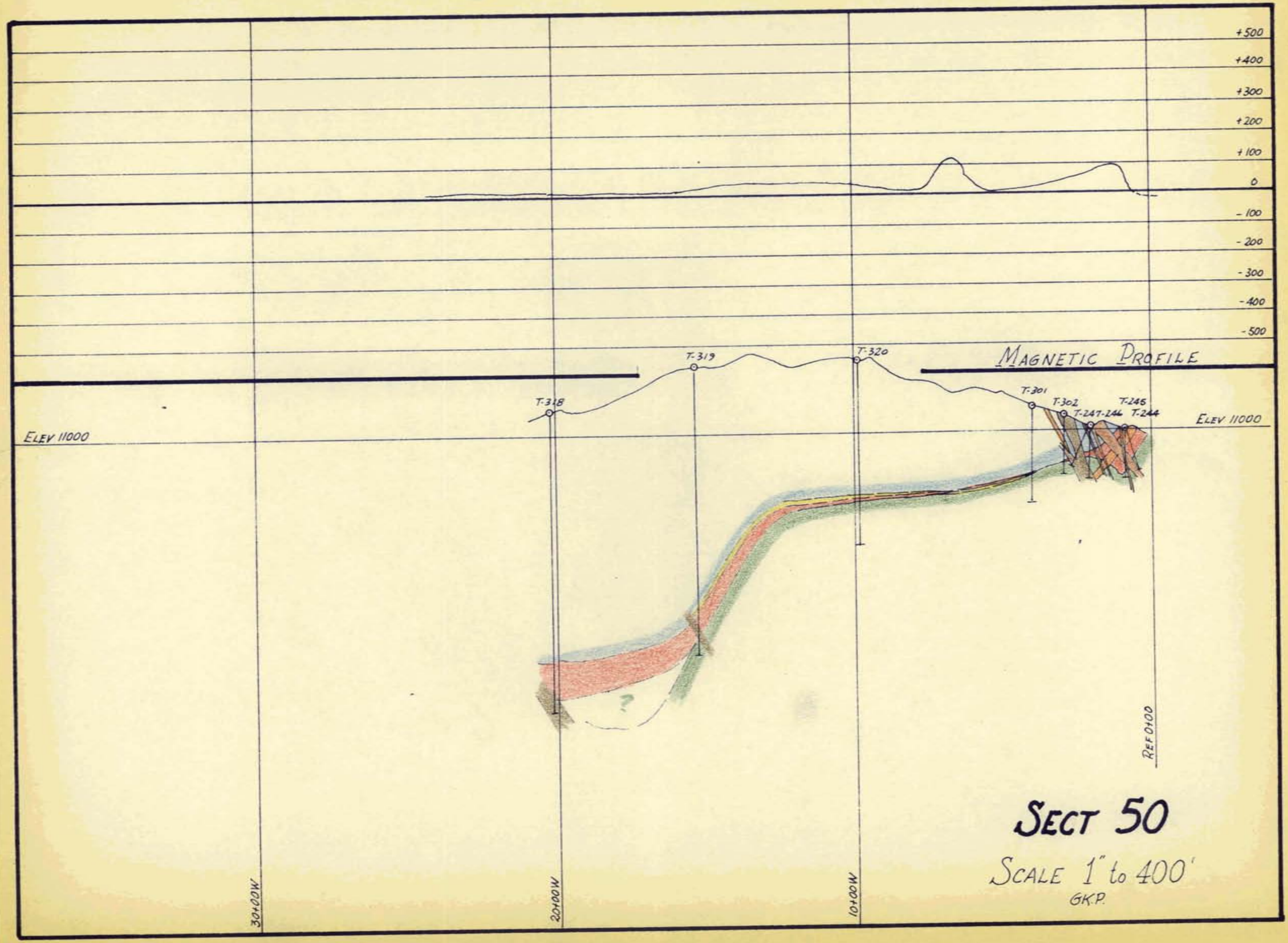


+500
+400
+300
+200
+100
0
-100
-200
-300
-400
-500
05
MAGNETIC PROFILE
T-219
T-224-225
T-39-38-
T-37-36
T-313
11000 Elev.
Elev - 11000
20+00W
10+00W
#3 Ref 0+00
10+00E
20+00E
SECT 26
SCALE 1" to 400'
G.K.P.

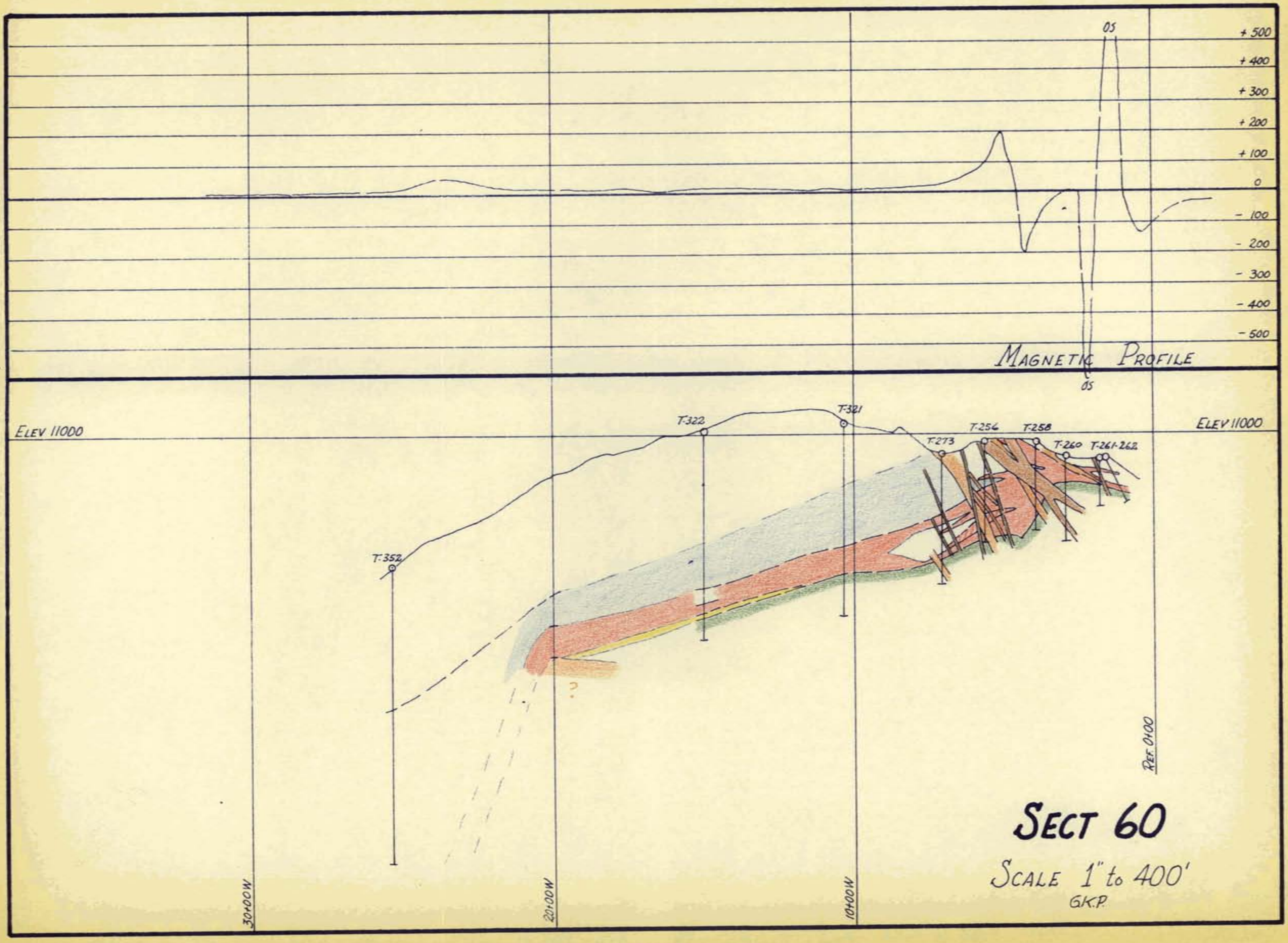

+ 500
+ 400
+ 300
+ 200
+ 100
0
- 100
- 200
- 300
- 400
- 500
MAGNETIC PROFILE
T-216
T-44-200
201-43
11000 - Elev.
Elev - 11000
20+00W
10+00W
#3 ZONE REF. 0+00
10+00E
20+00E
SECT 30
SCALE 1" to 400'
GKP



O.S.
+ 500
+ 400
+ 300
+ 200
+ 100
0
- 100
- 200
- 300
- 400
- 500
MAGNETIC PROFILE
SECTION 48
(projected onto section 34)
T-209-07-08
T-279
T-278
T-289
T-288
T-287
T-286
11000 Elev.
Elev.- 11000
20+00W
10+00W
#3 ZONE REF 0+00
#1-2 REF LINE
10+00E
20+00E
SECT 34
SCALE 1" to 400'
GKP



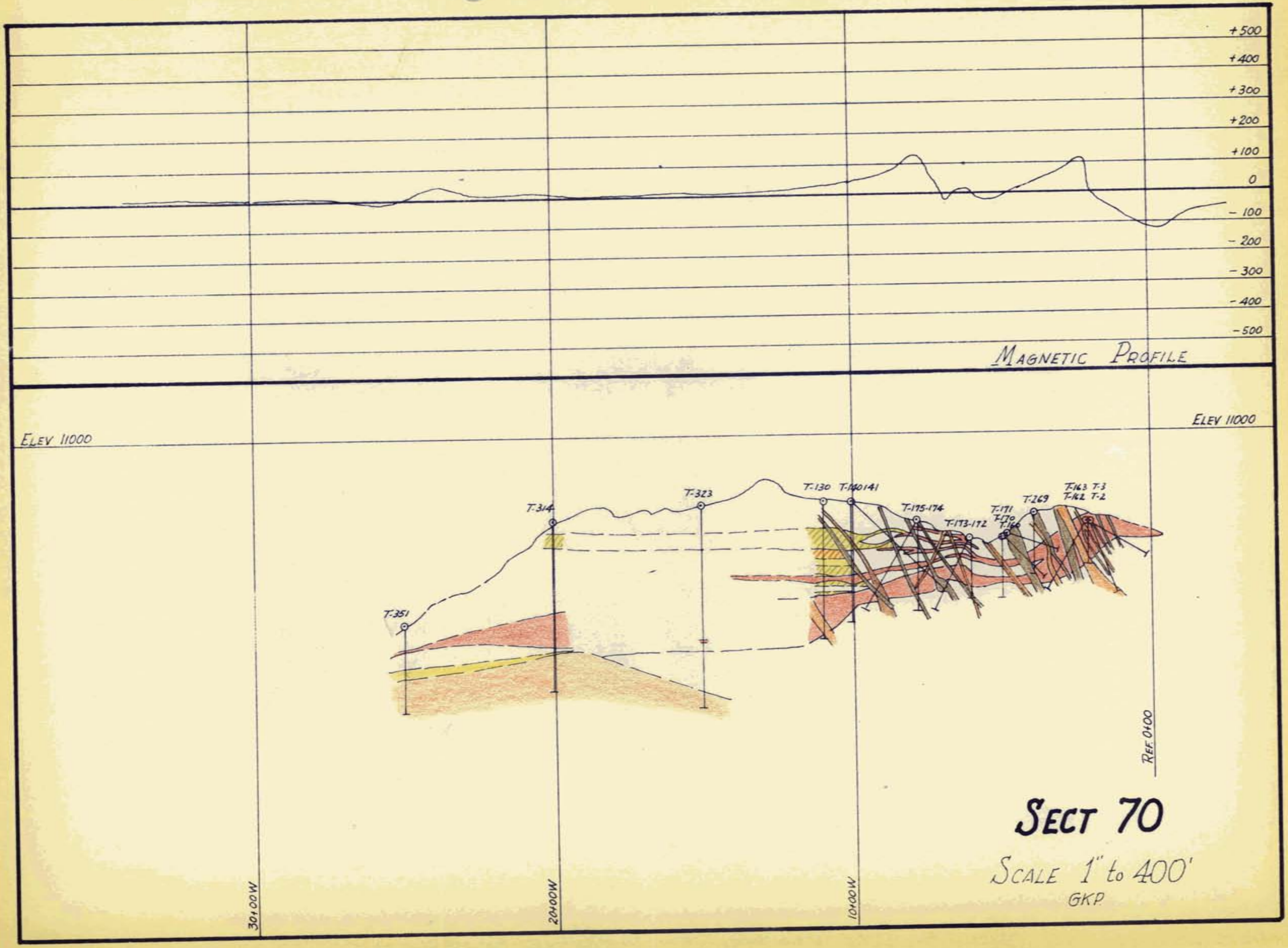
+500
+400
+300
+200
+100
0
-100
-200
-300
-400
-500
MAGNETIC PROFILE
T-319
T-320
T-328
T-301
T-302
T-247-246
T-246
T-244
ELEV 11000
ELEV 11000
?
REF 0+00
30+00W
20+00W
10+00W
SECT 50
SCALE 1" to 400'
GKP.

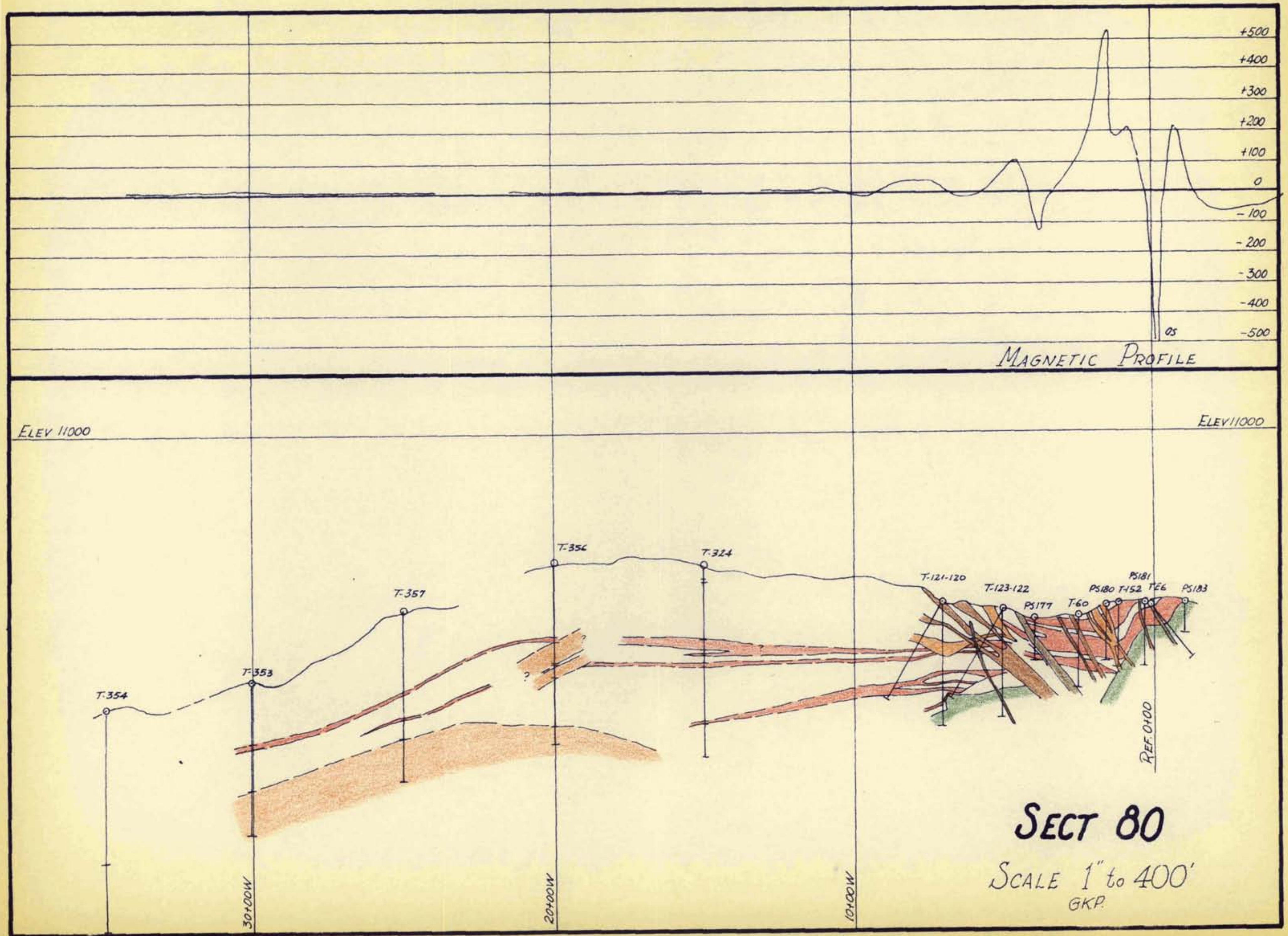


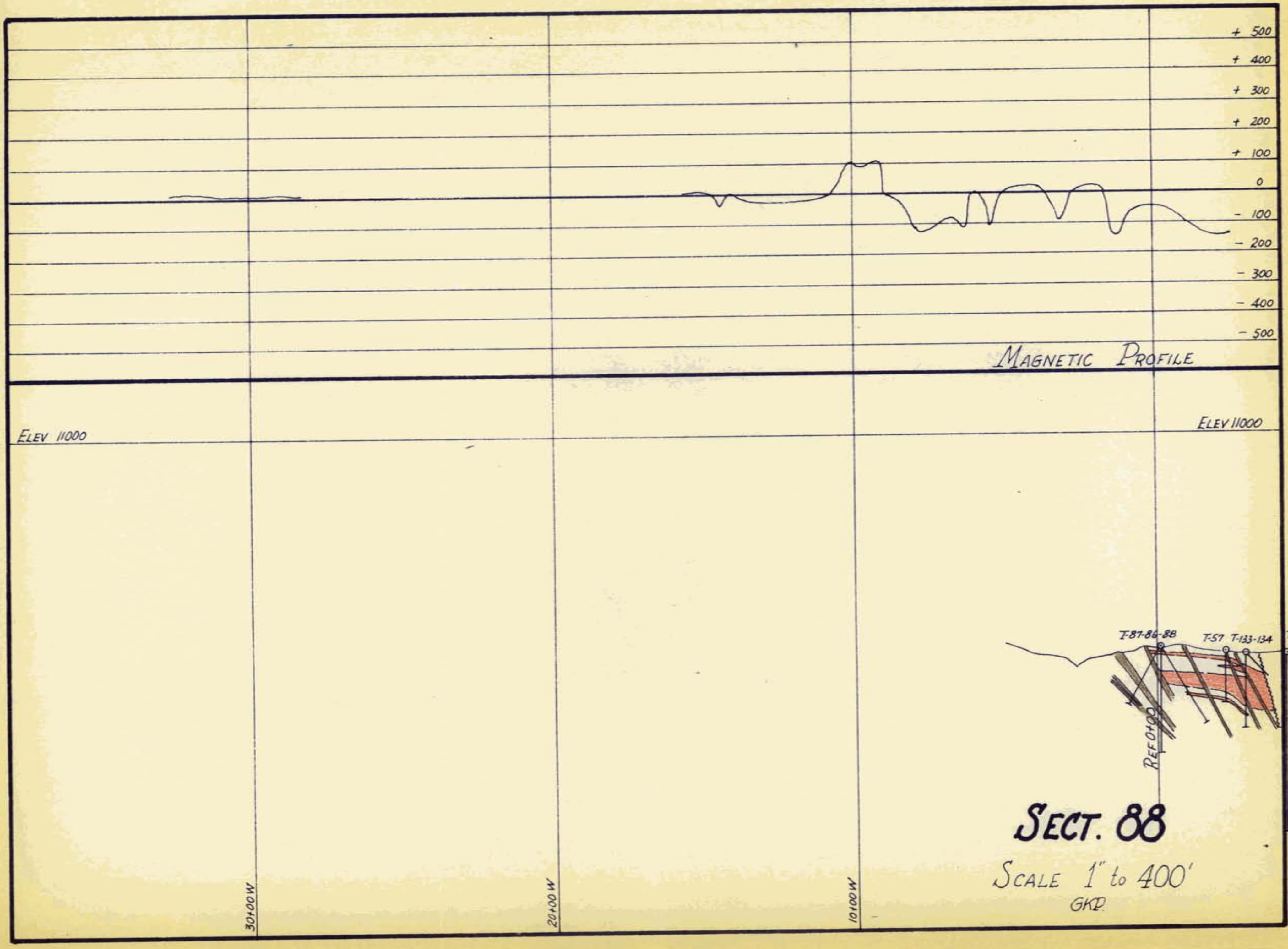

# SECT 60

SCALE 1" to 400'

G.K.P.


+500
+400
+300
+200
+100
0
-100
-200
-300
-400
-500
MAGNETIC PROFILE
ELEV 11000
ELEV 11000
T-351
T-314
T-323
T-130
T-140141
T-175-174
T-173-172
T-171
T-170
T-269
T-163 T-3
T-162 T-2
REF. 0+00
30+00W
20+00W
10+00W
SECT 70
SCALE 1" to 400'
GKP

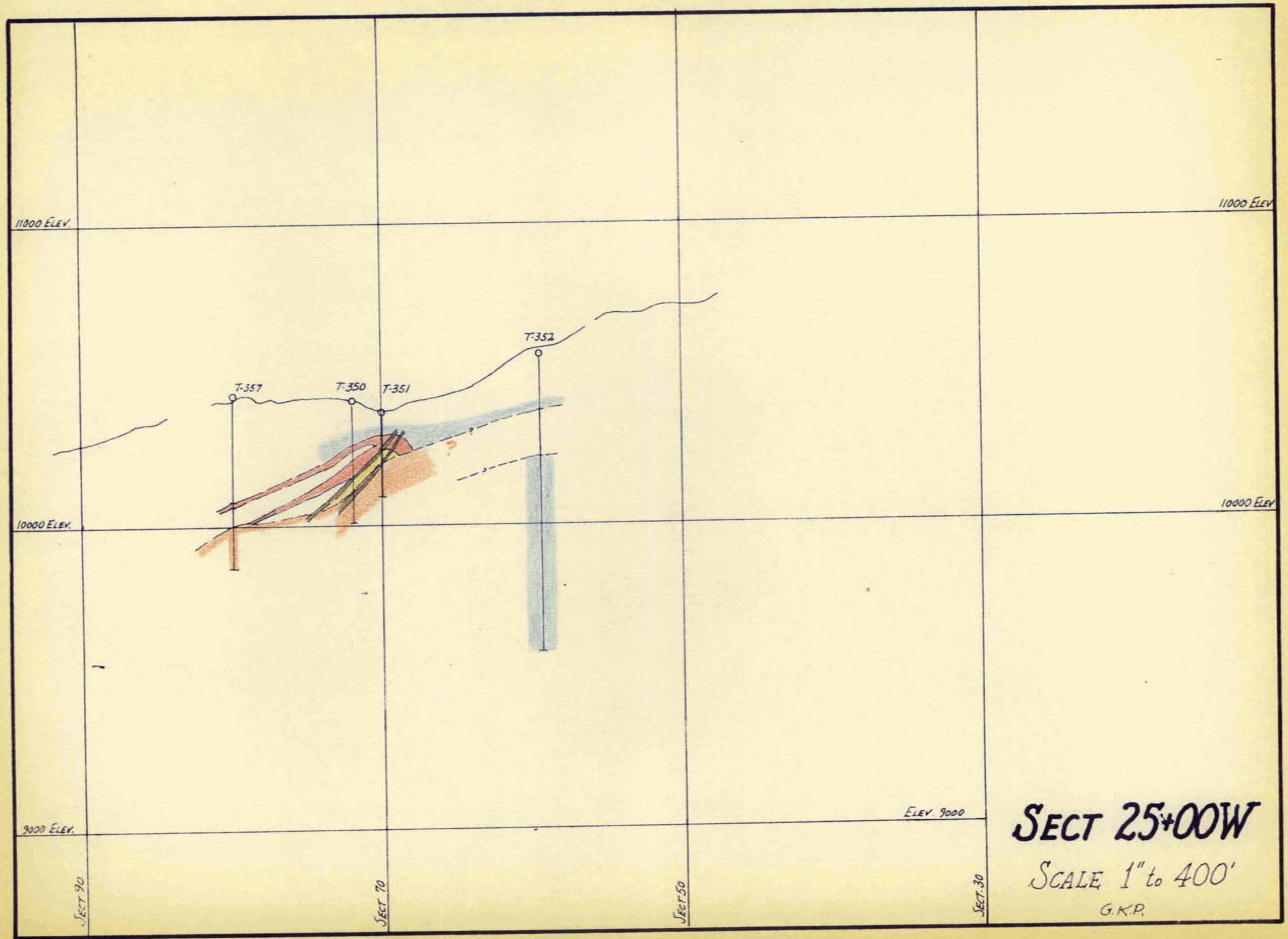

+500
+400
+300
+200
+100
0
-100
-200
-300
-400
-500
OS
MAGNETIC PROFILE
ELEV 11000
ELEV 11000
T-354
T-353
T-357
T-356
T-324
T-121-120
T-123-122
PS177
T-60
PS180
T-152
PS181
TE6
PS183
REF. 0+00
30+00W
20+00W
10+00W
SECT 80
SCALE 1" to 400'
GKP.



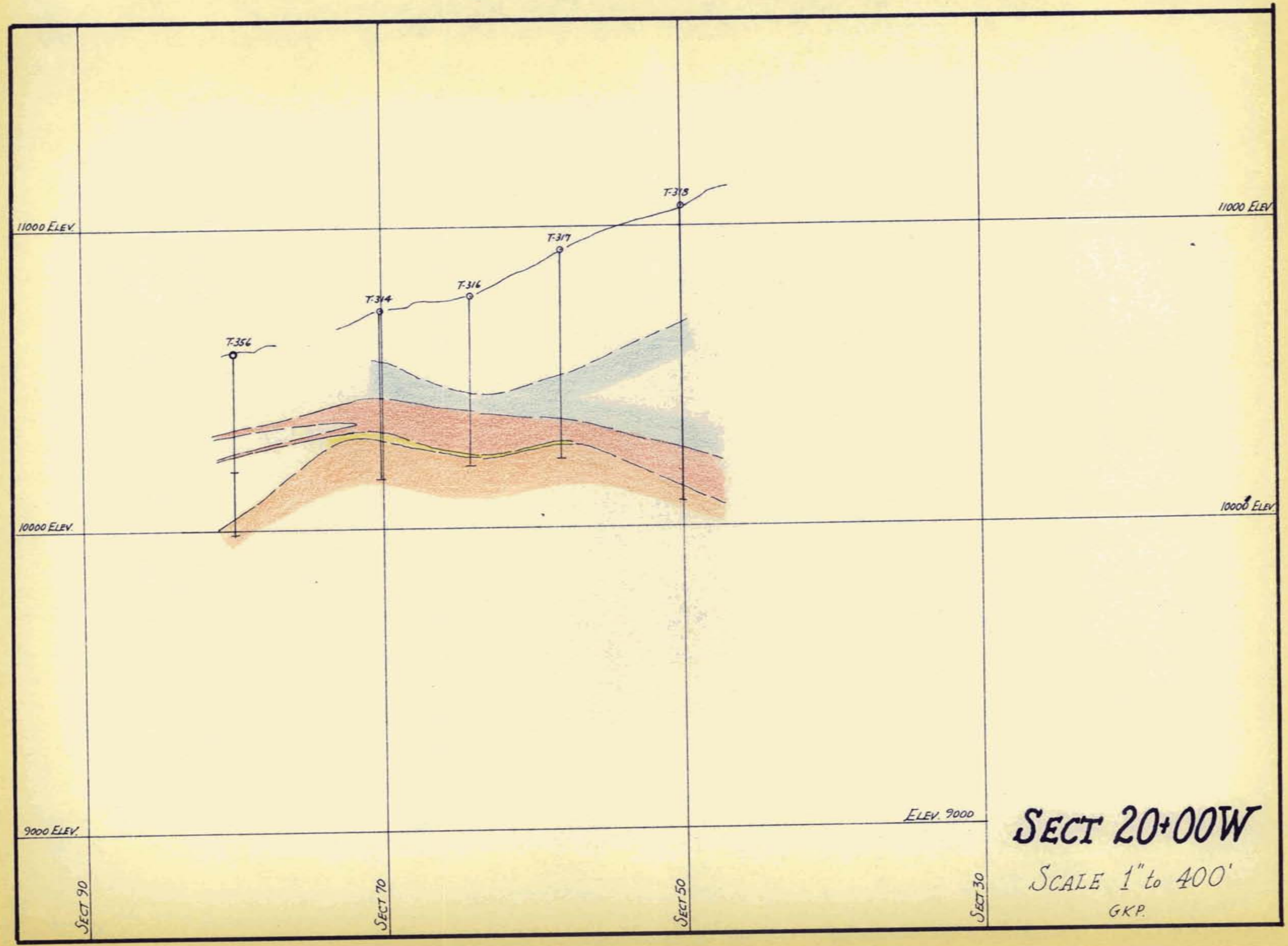

**SECT. 88**

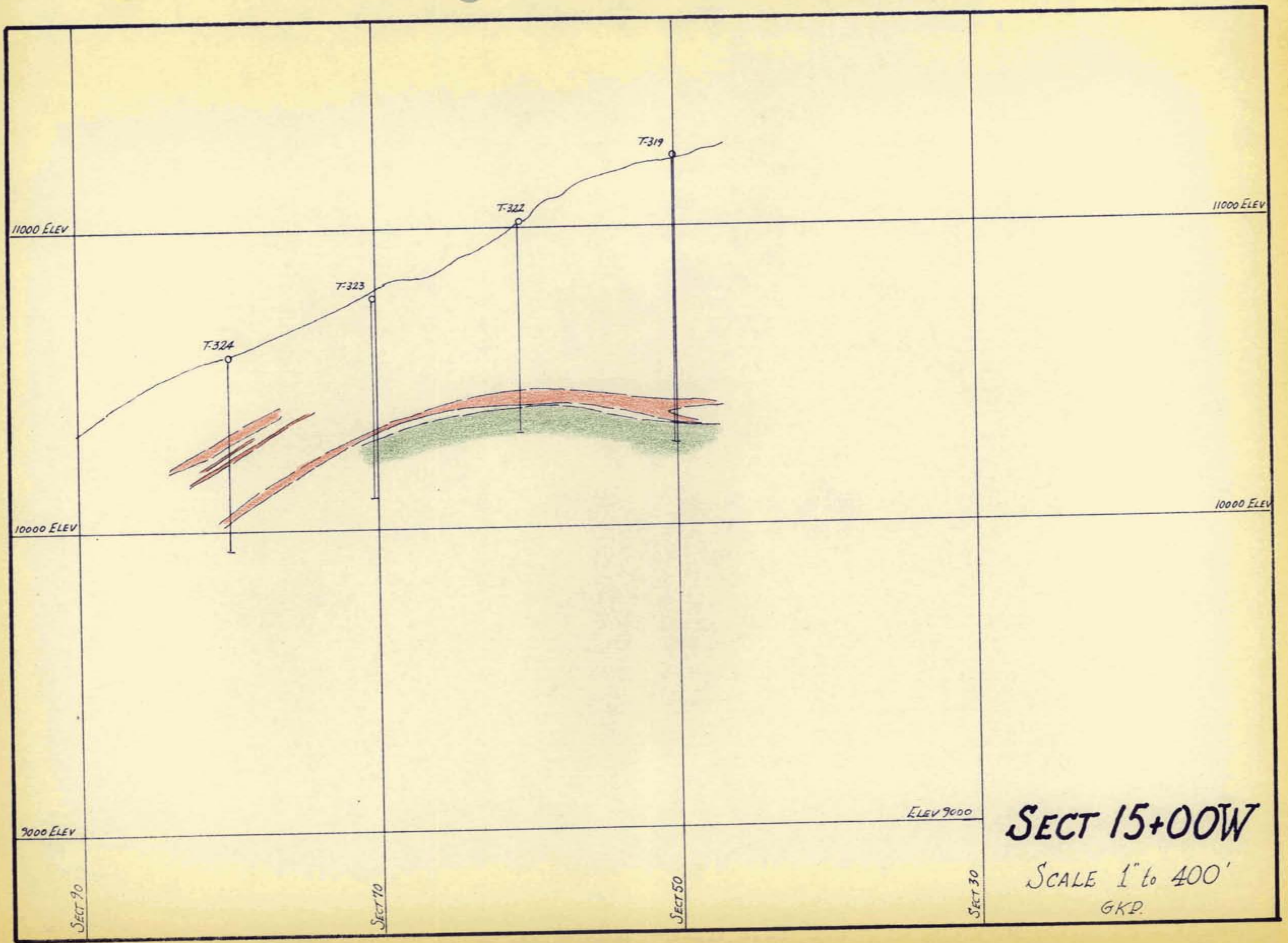
SCALE 1" to 400'

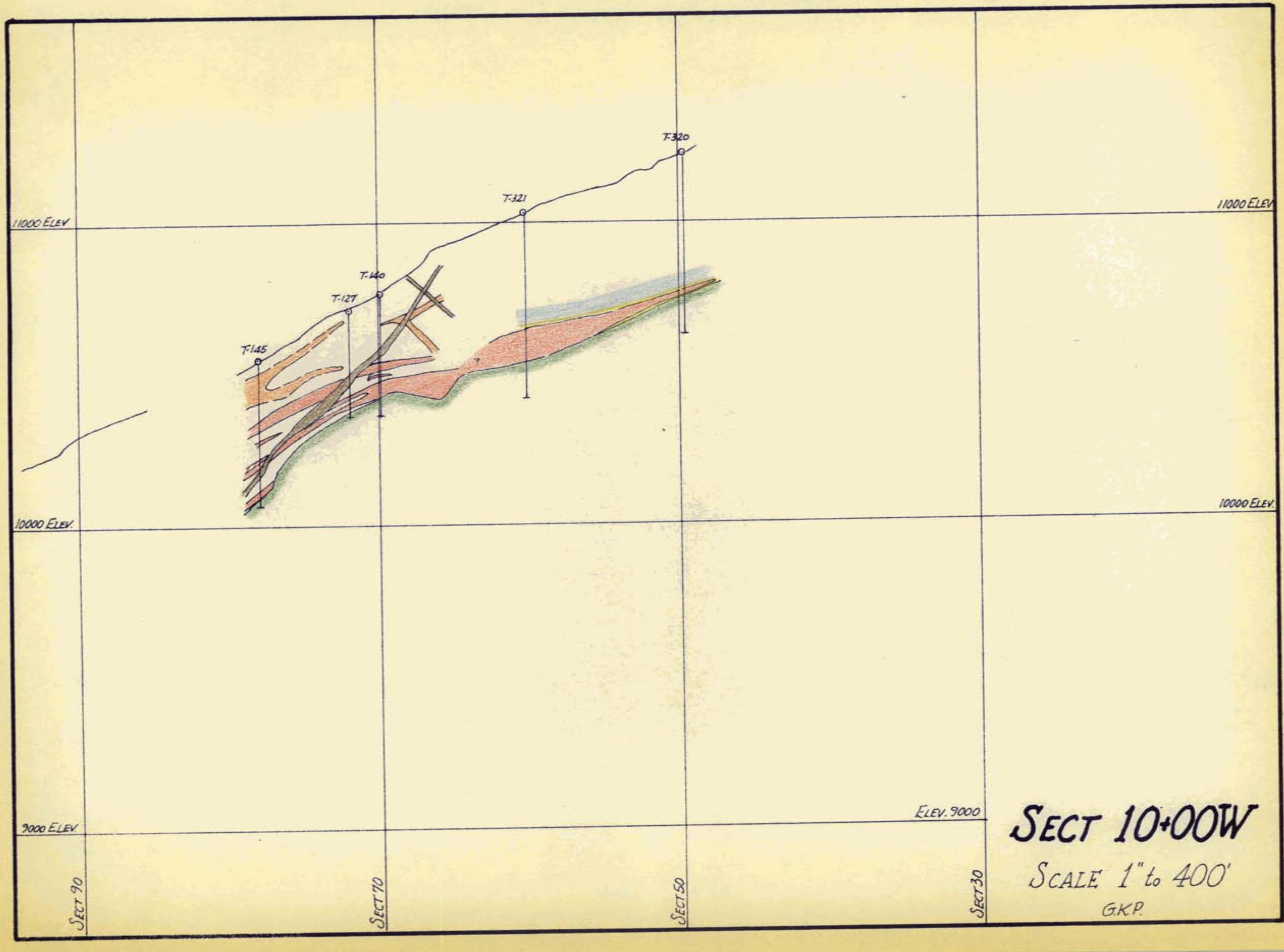
GKP

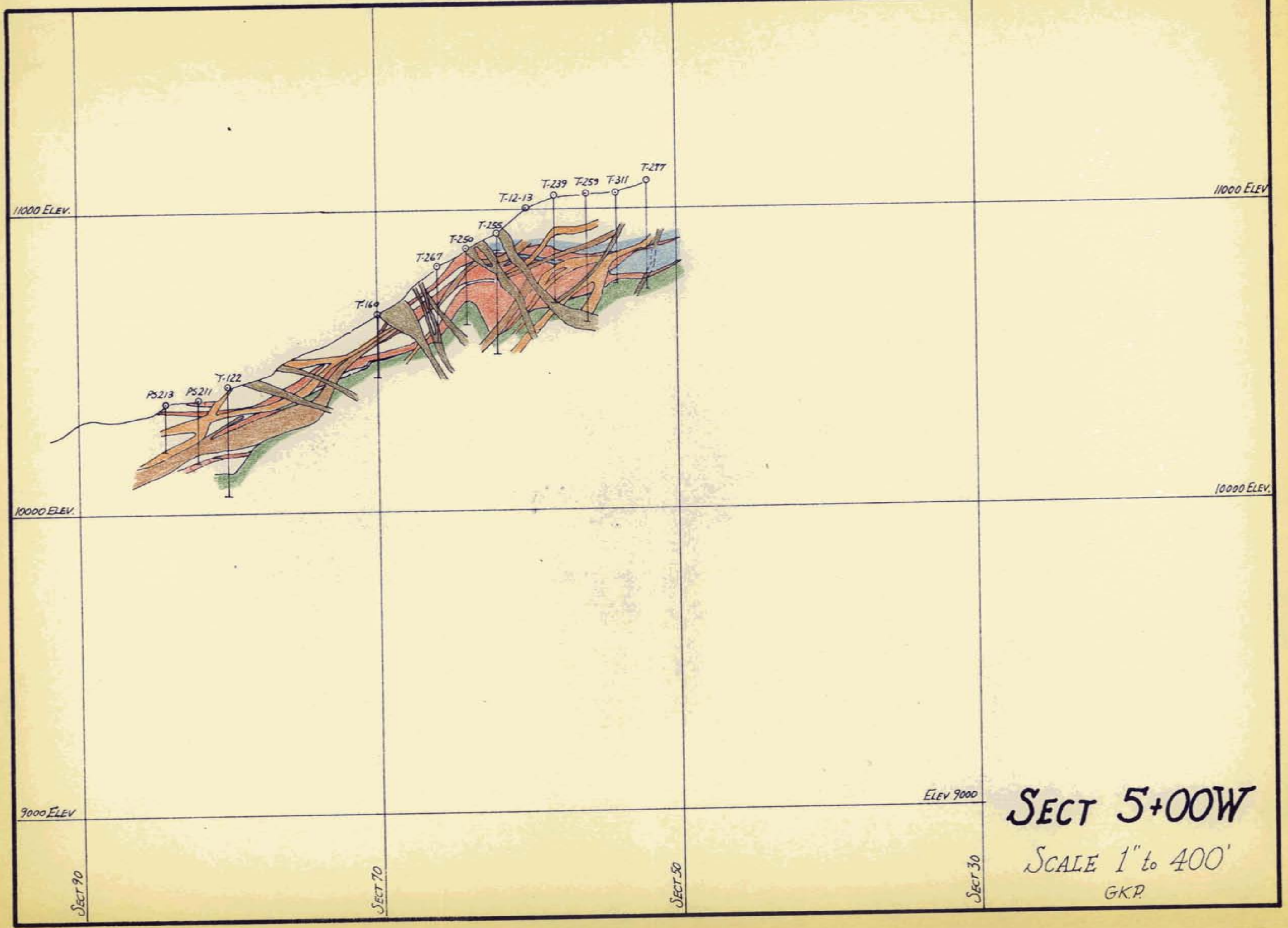


11000 ELEV.
11000 ELEV
10000 ELEV.
10000 ELEV
9000 ELEV.
ELEV. 9000
T-357
T-350
T-351
T-352
SECT 90
SECT 70
SECT 50
SECT 30
SECT 25+00W
SCALE 1" to 400'
G.K.P.

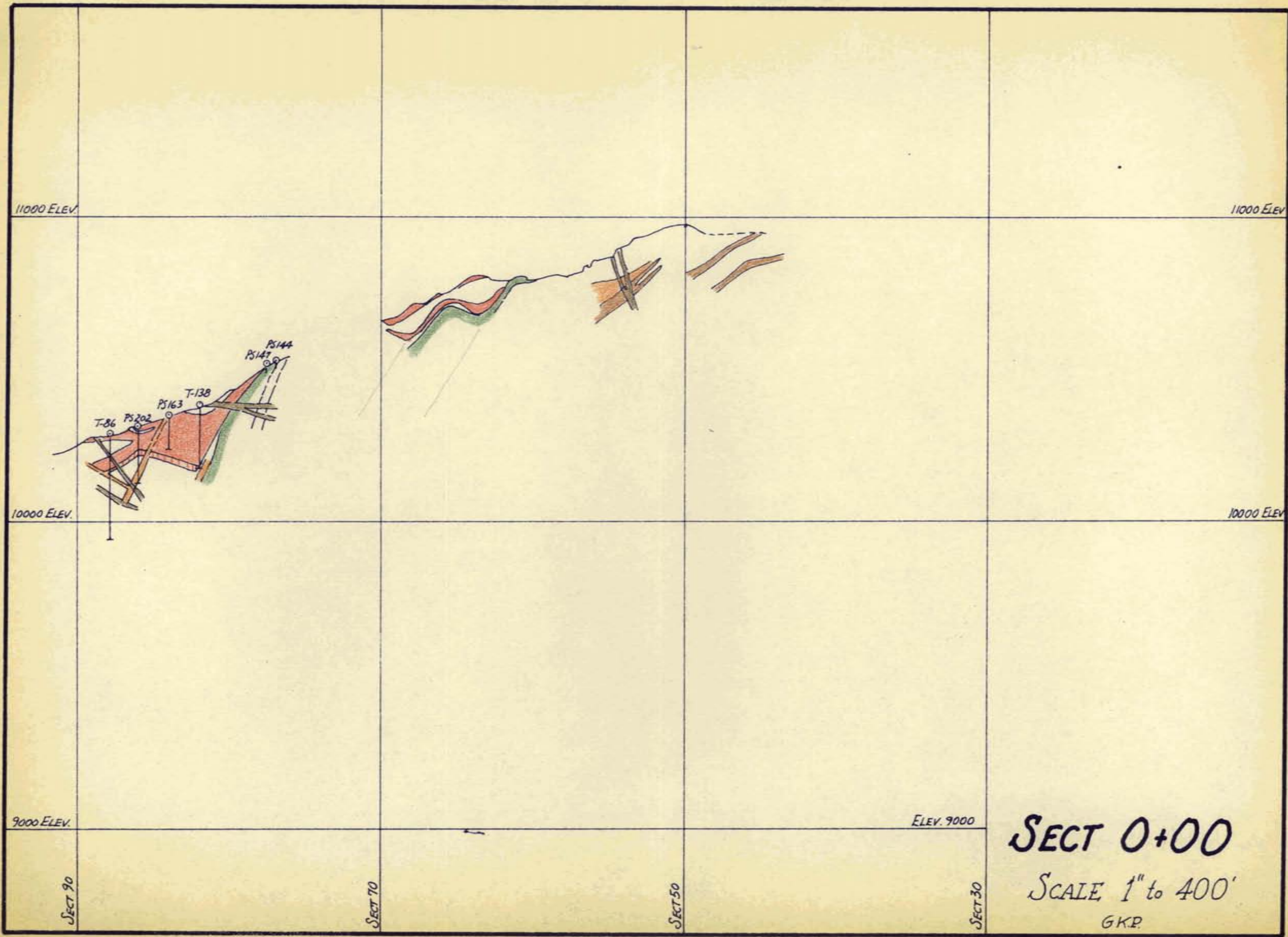

T-356
T-314
T-316
T-317
T-318
11000 ELEV.
11000 ELEV.
10000 ELEV.
10000 ELEV.
9000 ELEV.
ELEV. 9000
SECT 90
SECT 70
SECT 50
SECT 30
SECT 20+00W
SCALE 1" to 400'
GKP.


T-319
T-322
T-323
T-324
11000 ELEV
11000 ELEV
10000 ELEV
10000 ELEV
9000 ELEV
ELEV 9000
SECT 90
SECT 70
SECT 50
SECT 30
SECT 15+00W
SCALE 1" to 400'
GKP.


T-320
T-321
T-140
T-127
T-145
11000 ELEV
11000 ELEV
10000 ELEV.
10000 ELEV.
9000 ELEV.
ELEV. 9000
SECT 90
SECT 70
SECT 50
SECT 30
SECT 10+00W
SCALE 1" to 400'
G.K.P.



T-277
T-239
T-259
T-311
T-12-13
T-255
T-250
T-267
T-160
T-122
PS213
PS211
11000 ELEV.
11000 ELEV
10000 ELEV.
10000 ELEV.
9000 ELEV
ELEV 9000
SECT 90
SECT 70
SECT 50
SECT 30
SECT 5+00W
SCALE 1" to 400'
GKP.


11000 ELEV.
11000 ELEV
T-86
PS202
PS163
T-138
PS147
PS144
10000 ELEV.
10000 ELEV
9000 ELEV.
ELEV. 9000
SECT 90
SECT 70
SECT 50
SECT 30
SECT 0+00
SCALE 1" to 400'
G.K.P.