COMMONWEALTH OF AUSTRALIA

DEPARTMENT OF NATIONAL DEVELOPMENT

BUREAU OF MINERAL RESOURCES, GEOLOGY AND GEOPHYSICS

REPORT NO. 17

MOUNT PHILP IRON DEPOSIT, CLONCURRY DISTRICT, QUEENSLAND.

By

E. K. CARTER
(Bureau of Mineral Resources)
and
J. H. BROOKS
(Geological Survey of Queensland)

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Issued under the authority of Senator The Hon. W. H. Spooner, M. M., Minister for National Development

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LIST OF REPORTS

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THIS REPORT WAS PREPARED BY OFFICERS OF THE GEOLOGICAL SECTION, BUREAU OF MINERAL RESOURCES, AND GEOLOGICAL SURVEY OF QUEENSLAND.

MT. PHILP IRON DEPOSIT, CLONCURRY DISTRICT, QUEENSLAND.

by

E.K. Carter * and J.H. Brooks †

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SUMMARY

The Mt. Philp iron deposit occurs in rough country 48 miles south-west of Cloncurry, north western Queensland. It was mapped, by plane table, on a scale of one inch to 100 ft. and sampled in September and October 1953.

The deposit is associated with a fault subsidiary to the large Ballara Fault and occurs in a highly altered succession of basic volcanic and calcareous and arenaceous rocks. It has a total length of 11,000 feet and an average width of 85 feet and is composed essentially of hematite, magnetite, and quartz. Deleterious impurities are within acceptable limits.

Chip samples were broken along lines across the strike of the outcrop and about 200 feet apart. No costeaning or drilling was done to obtain data from non-exposed portions of the deposit.

As a result of the mapping and sampling it is calculated that the deposit contains :–

(i) 4,100,000 long tons of exposed ironstone, averaging 36.6% Fe. and 39.3% SiO_2.; including 2,750,000 long tons of exposed ironstone, averaging 46.9% Fe. and 30.4% SiO_2.; and

(ii) below outcrop level:
105,000 tons per vertical foot of ironstone, averaging 41.8% Fe. and 38.3% SiO_2.; including 71,000 tons per vertical foot of ironstone, averaging 48.5% Fe. and 28.7% SiO_2.

Changes in grade are fairly regular along the strike, but may be erratic across the strike; nevertheless it is considered that the deposit could if desired be worked by large-scale bulk-mining methods.

The low iron content, the high silica content, the relatively small size of the deposit, and its remote locality, render the working of the deposit at present uneconomic. It is therefore recommended that no further action be taken to develop or to undertake additional testing of the Mt. Philp iron deposit.

INTRODUCTION

PURPOSE OF INVESTIGATION.

The mapping and sampling of the Mt. Philp iron deposit were undertaken by members of a team consisting of geologists of the Commonwealth Bureau of Mineral Resources, Geology and Geophysics, and of the Geological Survey of Queensland.

The work was done at the request of the Geological Survey of Queensland as part of a pr gramme for the assessment of the iron ore resources of the State. As a result of a proposal that an iron smelter be established at Bowen it had become desirable that the fullest possible inform ation about the iron-ore reserves of the State be obtained.

LOCALITY AND ACCESS.

Mt. Philp is the highest point of a range, 2¼ miles long and a maximum of 260 feet wide, of siliceous iron oxide. The deposit forms probably the largest outcrop of massive iron oxide ir the Cloncurry Mineral Field.

The peak of Mt. Philp lies approximately at longitude 39°56'30" E, latitude 20°59' S; it is about 48 miles south-west of Cloncurry, which is the nearest town of any consequence. Tw and one half miles to the north of Mt. Philp is the site of the abandoned mining centre of Ballar

The distance by rail from Cloncurry to Townsville (the railway outlet for the area) is 481 miles; and Townsville is 119 miles by rail from Bowen. Cloncurry is linked by road to the eastern part of the State only by graded earth roads, which are not usable at times during the we season.

34 miles west-north-west of Mt. Philp is the mining centre of Mt. Isa, which is connected by bitumen road to Alice Springs, 735 miles distant, and thence by rail to Adelaide. Mt. Isa is connected by rail to Cloncurry (122 rail miles).

From Cloncurry or Mt. Isa to Mt. Philp communications are very poor. * In the dry seas the area can be reached by vehicle by various disused tracks. Easiest access is from the north. An ore carter's track is followed from a point on the road from Cloncurry to Mt. Isa 49 miles west of Cloncurry and 32 miles east of Mt. Isa. This track passes near the King's Cross group of copper mines and continues in a general southerly direction to cross the Corella River one mile upstream from the old Rosebud copper mine. From this point it continues generally south to the site of Ballara township. Beyond Ballara a faint track runs south, across Jimmie's Creek and to the east of the prominent Ballara Fault ridge to Fountain Head Waterhole, 3½ miles from Ballara Mt. Philp range lies about a mile to the east and south-east of the waterhole. Total distance fro Cloncurry is 73 miles.

Alternatively, the area may be reached from Malbon township or Devoncourt homestead by using station tracks and then following the course of the now-removed Devoncourt-Ballara narrow gauge railway. The distance from Devoncourt railway siding is 27 miles and from Devoncourt homestead 33 miles.

Use of a four-wheel-drive vehicle is advisable on the route from the north and essential on that from the south-east. Local guidance should be sought before any attempt is made to rea Mt. Philp. The area is inaccessible by vehicle after heavy rain.

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* *Since this report was written the search for uranium in the area has opened up communications considerably.*

CLIMATE.

The district has a continental tropical climate. The winter is mild and dry, with cold winds at times. The summer is hot: maximum temperatures in excess of 100°F. are normal. Most of the rain falls between January and March, but heavy thunderstorms are to be expected from October to the onset of the main rains. Annual rainfall at Cloncurry averages 18 inches, but is very variable. The rainfall may be slightly higher at Mt. Philp because it is at a higher altitude.

TOPOGRAPHY.

Mt. Philp lies in the upper reaches of the Malbon River system. This area is near the continental divide between the major north-flowing and south-flowing river systems. Topographic relief is not great – about 600 feet – but the general level of the country is about 500 feet higher than at Cloncurry.

The country is very rough, owing to the type of rock outcrop, the abrupt change in rock types, and certain structural elements such as the quartz-filled Ballara Fault. The roughness of the terrain makes movement through the country difficult: movement by vehicle away from tracks is very restricted. Gullies and watercourses, through rarely water-filled, are commonly steep and are not readily negotiable.

WATER SUPPLY AND TIMBER.

Permanent surface water is to be found in the Fountain Head Waterhole, one mile from Mt. Philp Range. This pool is about 60 feet long, 40 feet wide, and 7 feet deep. The level is maintained by a small perennial spring emerging from the Ballara Fault. The supply would not be adequate for any but the smallest mining operations.

A concrete retaining wall in the Corella River at the Rosebud copper mine, 12 miles north of Mt. Philp, has impounded a considerable body of water; it was presumably sufficient to serve the Ballara mine and smelter. Natural waterholes occur some distance downstream from the dam. Other small soaks exist within a mile of Mt. Philp, so that additional water could undoubtedly be obtained by boring. The selection of bore sites would call for care because of the rock types present.

The area is lightly to well covered by vegetation, but good timber trees are scarce. Some large logs, suitable for mine and quarry use as undressed timbers, could be obtained from the main watercourses, and there could be an adequate supply of small timbers suitable for lagging and similar purposes.

HISTORY AND PREVIOUS INVESTIGATIONS.

Earlier in this century the Ballara area was an active copper-mining centre.

Dunstan (1920, p.38) estimated the tonnage of iron ore available in the Mt. Philp deposit as 20,000,000 tons with possible reserves of a further 20,000,000 tons.

In 1936 M.L. Wade mapped the Ballara area under the supervision of C.S. Honman of the Aerial, Geological and Geophysical Survey of North Australia (Honman, 1938). They were content to quote Dunstan's figures for the tonnage of ironstone in the Mt. Philp deposit, but collected sixteen specimens, the assay of which yielded an average content of 52.6% Fe, 19.5% SiO_2, 0.7% Al_2O_3, less than 0.3% MnO_2 and traces of MgO, CaO, P_2O_5, and S. Since then the occurrence has been examined by representatives of at least two mining companies, but no repor of the inspections have been published.

Three small test pits have been sunk alongside the outcrop, but whether they were for the purpose of examining the iron deposit or sunk by prospectors in search of copper or gold is not known.

OTHER OCCURRENCES OF IRONSTONE* IN THE CLONCURRY MINERAL FIELD.

Massive iron oxide has been reported from the Lochness area (Jensen, 1941), 80 miles north-west of Cloncurry. The deposit is very difficult of access. It consists of two parallel replacement bodies, 150 feet apart, in limestone. The easterly body is about 300 feet wide and the westerly body 150 feet. The highest points are about 500 feet above general plain level. Jensen reports that the belt can be followed for nearly a mile without appreciable diminution in width. A chip sample of the massive ironstone of the eastern outcrop assayed 44.82% iron and 0.21% phosphorus. Structurally the deposit appears to be similar to that at Mt. Philp – i.e. it i apparently formed by replacement of country rock along faults or shears subsidiary to the Lochne Fault. Assays of chip samples from the western body showed 0.46% and 0.62% lead and traces o gold.

At Mt. Oxide, 95 miles north of Mt. Isa, a massive ironstone body is associated with the Mt. Oxide copper orebody. It is probably derived in part at least from sulphides, and would therefore not be likely to provide a useful source of iron ore.

A deposit, described as "a magnetite reef" 2,200 feet long and 120 feet wide, occurs 6 miles south-south-east of the Dugald River lead-zinc prospect (Sturmfels, 1952).

Mt. Leviathan (or Black Mountain), two miles south-west of Cloncurry, is composed of siliceous ironstone (hematite and magnetite), and appears to be similar in type to the deposit at Mt. Philp. A very rough estimate, based on barometric heights at the top of the hill and at road level and on aerial measurements from aerial photographs at a scale of ¾ mile to the inch, sugge the tonnage of ironstone above general ground level to be of the order of 500,000 tons. Two samples, consisting of chips taken at random, were collected; one on the southern flank and the other on the northern and eastern flanks of Mt. Leviathan. The former assayed 59.6% Fe and 12.1% SiO_2 and the latter 57.5% Fe and 16.7% SiO_2. These samples are probably not representa of the average grade of the deposit, which may be lower.

A much smaller, but similar, body one mile south-east of Cloncurry is known as Mt. Pisa.

A line of discontinuous bodies of apparently high-grade ironstone occurs west of Mt. Do and Mt. Cobalt, 70-75 miles south of Cloncurry. They appear to be bedding replacement deposit though they may be associated with strike faulting. None of the deposits is likely to contain m than 100,000 tons of mineable ironstone.

* *Throughout this report the term "ironstone" is used in preference to the more commonly used "iron ore" because of the economic connotation of ore. Ironstone should be taken to mean rock rich in hematite or magnetite but not necessarily of economic grade.*

Twenty miles farther north, near Hematite railway siding, a deposit of limonite was worked orsome years for use as smelter flux. The deposit is now almost exhausted.

Another deposit apparently similar in type to that at Mr. Philp occurs 4 miles south-south-east of the latter. It appears to be much smaller than the Mt. Philp deposit and may not be as massive: t was not examined.

SCOPE AND METHODS OF MAPPING.

The survey was carried out during September and October, 1953; the time occupied with the survey being 3½ weeks. The party consisted of E.K. Carter, geologist-in-charge; J.H. Brooks and R.B. Fraser, geologists; and four assistants. E.K. Carter was responsible for most of the plane-table survey and for the regional mapping; J.H. Brooks did the detailed geological mapping of the deposit and its environs; R.B. Fraser did the remainder of the plane-tabling and supervised the sampling programme.

The intention was to determine the available tonnage of iron ore in the deposit, the geological environment, including genesis, and the prospects of further ores being found by exploration.

Pressure of time and the threat of impending rain, which could have isolated the party, made a hurried survey necessary; in particular the time spent on the regional mapping and on check plane-table work had to be curtailed.

The deposit and its environs were mapped by plane table and telescopic alidade, at a scale of 1" = 100'. The rough nature of the outcrop and high topographic range involved did not lend themselves to this type of survey. In places vertical or overhanging faces of rock have a height of 30 feet. This made necessary the running of three separate traverse lines, one on either side of the deposit and one along the top. The three lines were tied into one another wherever possible. In places angles of sight of 30° elevation were necessary, thus impairing the accuracy of the survey.

The regional map was produced as a result of three days' traversing across the strike of the country, using aerial photographs of a scale of approximately 1 inch to 950 feet. Subsequent photo-geological interpretation proved more difficult than had been expected, particularly in the irregularly folded area east of the Mt. Philp range and south of Fountain Head Creek. The regional map is consequently essentially an interpretation based on limited field data.

GEOLOGY

REGIONAL GEOLOGY.

Stratigraphy and Lithology.

The rocks of the area are believed to be Lower Proterozoic in age. They are part of the stratigraphical unit named by Shepherd (1953, page 385) as the Corella Limestones.

The metasediments to the west of the deposit are fairly typical of the Corella Limestone sequence. They probably represent highly altered shale, sandstone, argillaceous and arenaceous limestone and dolomite. Lenses of calcite – up to 20 feet across – are common. The alteratic has been brought about by dynamic and widespread thermal metamorphism which has resulted in the formation of rocks rich in felspar, pyroxene, and amphibole, with iron oxides, epidote, sphene, and other accessory minerals. The pink coloration observable in many of the rocks is probably due to the expulsion of ferric oxide during metamorphism. The rock types and grade of metamorphism are comparable to those described by Edwards and Baker (1954) from the Duchess, Trekelano, and Dugald River areas. Only one rock specimen examined in this section under the microscope revea the presence of scapolite, but this mineral is probably not uncommon in the area.

Associated with the metasediments are several occurrences of amphibolite, which were observed not to transgress the bedding at any point. These were originally either basaltic flows or dolerite sills. The outcrop pattern, as determined by photo-geological interpretation, suggests that some at least are sills; but this could hardly be accepted as conclusive evidence. The amphibolites appear to have suffered the same folding and metamorphism as the metasediments.

East of Mt. Philp the rocks are not so typical of Shepherd's Corella Limestones, though they undoubtedly belong to the same stratigraphical unit. The most abundant rock type contains sparse to numerous angular fragments set in a matrix which may be fine and siliceous, gritty, or of crystalline silicate minerals. Breccia fragments cover the same range of material, but, in additior in places angular inclusions of basalt up to 6 inches long, or of former basic rock now altered to aggregates of actinolite, are common.

A large sub-circular structure, approximately two miles in diameter, lies two miles north-east of Mt. Philp. It has been interpreted by the senior author as the eroded core of an ancient volcano. The presence of this, considered in conjunction with the appearance of the breccia-type rock, leaves little doubt that the latter is a coarse agglomerate. Along the east flank of the iron-stone deposit are scattered outcrops of a breccia which does not appear, within itself, to have any volcanic affinities. It may be a pre-mineralization fault breccia, but is probably related to the vulcanism in the area. In contrast to the breccias of volcanic origin a tectonic breccia younger than the mineralization may be seen near the fault towards the southern end of the deposit (see Plates 2 and 5).

The sediments east of Mt. Philp are generally much more siliceous and less calcareous th those to the west. Amphibolites are plentiful; some of them have vesicles preserved in them, showing that they were flows.

Structure.

West of Mt. Philp the structure is dominated, and in large part determined, by the Ballara Fault. This is a major regional feature which trends at approximately 50°. It is a shear fault along which the north block has moved east relative to the south block. The amount of horizontal displacement has not been determined, but it is probably at least half a mile. The beds between Mt. Philp and the Ballara Fault appear to form the west limb of an anticline. As the fault is approached, however, the beds are dragged to the north-east and have been overturned to give eas dips.

East of the deposit the structure is less regular than to the west. Folding is strong, with lips up to 80°, but open. Some of the irregularity may be due to initial dips and irregular surfaces ın which lava and agglomerate were extruded.

The marked difference in lithology and the folding pattern on the two sides of Mt. Philp ange strongly suggest a structural break between them. In the opinion of the authors a pre-mineralzation fault occurred along the crest or the western limb of an anticline; and this fracture was ;ubsequently filled with iron oxides and silica, by hydrothermal solutions. The nature of the leposit is further discussed in the next section.

Probably the fault containing the ironstone is a feather fault subsidiary to the Ballara Fault. ;poradic outcrops of ferruginous material, some with breccia fragments, may be traced north from he northern end of the deposit to near the Ballara Fault. The displacement along the fault is not ;nown but is probably not great.

;EOLOGY OF THE LODE.

The lode has a length of 11,000 feet, and a general strike for the greater part of its length ›f 20° (magnetic). This roughly conforms with the strike of the surrounding rocks. Locally, how;ver the strike varies considerably from this general bearing (see Plate 2). The dip of the lode is ıot continuous in outcrop over its whole length: in several places, e.g. at Rocky Gully, it lenses ›ut completely. Width of outcrop averages 85 feet. The maximum width of 260 feet is attained ıear Mt. Philp Peak. The bed of Fountain Head Creek, near where it cuts the deposit, is 600 feet ›elow the top of Mt. Philp. In some places the ironstone rises by stepped faces as much as 150 'eet above the base of the lode outcrop. Falling away from the outcrop on either side is a fairly ıniform slope, thinly covered with ironstone scree. Several isolated bodies of ironstone occur withn 1,000 feet of the main lode, but, though their grade is higher-than-average they are not large ;nough to add appreciably to the potential reserves of the occurrence. The largest is at co-ordinate 150N, 1800E.

;enesis.

The mineralization is epigenetic, and appears to have been introduced along the fault, as lescribed in the previous section. Both the field structural evidence and mineragraphic work (see Appendix), which indicates crystallization at high temperature, demonstrate the point. Further, in he bed of the large creek west of the southern end of the lode, a narrow siliceous dyke can be seen, vhich transgresses the bedding of the enclosing rocks and which contains magnetite and hematite. This is probably either a feeder channel or an off-shoot from the main body.

Evidence that iron mineralisation took place later than the regional and contact metamorphsm of the area can be seen in an isolated outcrop at 3800N, 200E. Here the pre-existing rock has ›een partially replaced by iron, and weathered surfaces are very similar in appearance to those of he unreplaced calc-silicate rocks. The surface pattern in the latter is determined by the preferntial weathering-out of certain metamorphic minerals.

Though solutions were probably introduced along the fault the wall rocks have been xtensively replaced. The limits of mineralization are fairly sharp, but replacement is by no means omplete throughout the lode; this is the reason for the wide variations in assay values. In gener., grades are high on the eastern side of the deposit than the western. Also, assay results show steady falling off in the grade from north to south. In places south of Mt. Philp banded quartzite ıs been so little replaced by iron that assays range from 10% to 30% Fe. Beds and laminae have een selectively replaced; apparently those which were most siliceous were least replaced.

Structure.

The preservation of bedding in places in the ironstone makes it clear that at least two of the "buckles" in the surface exposure of the lode are due to folds in the bedding which have be replaced in part. Near 8200N, 850E there is a tight asymmetrical fold whose axis pitches 540NW An anticlinal fold near the southern end of the lode appears to be overturned (1600N, 1800E). These folds are probably drag-folds associated with the pre-mineralization faulting.

Some of the "buckles" in the lode may be due to cross-faulting. Very faint lines can be observed on the aerial photographs trending towards some of the buckles, but the existence of faults could not be established.

The post-mineralization fault at 1600N, 1950E has already been referred to. It has a strike of 19° and is almost parallel to the axis of the fold in this vicinity.

Joints are strongly developed in the lode, but they are generally widely spaced. Joint planes are irregular in attitude, and joints along parallel planes do not persist for more than 400 to 500 feet. The presence of these joints, along which huge boulders have parted during weather should greatly facilitate primary breaking of the ore if the deposit is worked. Slickensiding is a commonly developed feature on joint faces, but movement is thought to have been slight.

Mineralogy.

In the field, the lode appears to be essentially hematite, with variable proportions of magnetite. Quartz is the principal impurity. Typical lode material, in outcrop, consists of fine granular hematite intimately mixed with fine quartz grains. Even in the highest-grade material fine grains of quartz can usually be seen in hand specimens. In the richer parts of the lode, it i not unusual for the hematite to occur in specular form. This is more susceptible to weathering than the granular hematite and so is less conspicuous in outcrop. Bladed and micaceous forms of hematite also occur.

The presence of magnetite erratically distributed in the lode is demonstrated by large local deviations of the compass needle. In places bearings and back-bearings vary from the norr 180° difference by as much as 60°. Local magnetic variations, however, are commonly less thar 5°.

Mineragraphic investigations of several specimens by W.M.B. Roberts, of the Bureau of Mineral Resources (see Appendix), indicate that the magnetite present is titaniferous in part. Chemical analyses (see p.13) indicate that titanium is not a serious impurity.

Silica is present in the form of quartz and quartz-hematite veins, and also as unreplaced silica-rich bands. Quartz veins and stringers occur in the section north of 8000N; but these veins and stringers are usually confined to the hangingwall (western) section of the lode and could be mostly excluded in mining. The only place north of Fountain Head Creek where sample grades fall below 50% Fe. is in a zone of quartz veining. South of 6500N unreplaced silica becomes a serious impurity, which, in general, increases in amount to the south. The main lode south of Rocky Gully may be called a hematite quartzite, as assay figures show that the content of silica in this part of the lode is considerably higher than that of iron.

ECONOMIC GEOLOGY.

When an attempt is made to estimate the tonnage of ironstone of a given grade available for mining the following factors have to be considered :-

- Dimensions of the lode at depth;
- Grade of the lode at depth;
- Possibility of the existence of ore-shoots;
- Possibility of concealed deposits;
- Deleterious associated elements;
- Strength of the wall rock.

Dimensions of the Lode at Depth.

Surface mapping gives little idea of the probable behaviour of the lode below outcrop level. At Fountain Head Creek the lode is narrower at creek level than it is at higher levels on either side. The creek however probably cuts through the lode at the narrowest point, and the apparent thinning of the lode at the lower levels is probably illusory.

With a fissure-filling and replacement type of body such as that at Mt. Philp it is reasonable to assume that the body would be much deeper than it is wide.

The lode is probably at no level much wider than it is as the surface. In numerous places the contact between lode and country rock is exposed and reveals that the main wall of the lode, even where it forms a cliff of considerable height, is, in fact, at the contact.

Owing to the pitch of the drag-folds and local lensing in the lode, the shape of the lode may vary at depth, but it may reasonably be assumed that the overall area of cross-section remains sensibly the same for some distance below outcrop level. Pitching and lensing of the lode or of any ore-shoots may adversely affect the total available tonnage particularly if large scale methods of extraction are used.

Grade of the Lode at Depth.

The grade at depth is unkown, and it has had to be assumed that the primary grade is constant below the outcrop level to the lowest point of probable mining.

Superficial processes may have affected the grade at the surface. The surface of the lode in many places appears to be coated with silica and it was thought that chip sampling of surface exposures only might give non-representative assay results. To obviate this, at every tenth sample line a second sample was taken from freshly-broken surfaces only. There was no consistent variation between the two samples so taken. Roberts (see Appendix) found no evidence of secondary silicification in any of the specimens studied by him. This does not exclude the possibility of a deeper impoverishment – to a depth of, say, 10 to 20 feet – by surface silicification. The lode does not appear to have been superficially enriched in iron.

Possibility of the Existence of Ore-Shoots.

Generally, each sample was cut across the full width of the lode (wherever the surface outcrop was accessible) so that little data are available on the variation in iron content across the lode. At some of the points of greatest width more than one sample was taken; some of these showed striking variations in grade (see p.11 and Plate 6). This evidence, together with the general observation of more complete replacement in the eastern part than in the western part of the lode, leaves little doubt that the estimate of tonnage of mineable ore of a given grade could, by a programme of sectional sampling across the strike, be increased appreciably over that calcu ated on present assay data. However, the gradual change in grade along the strike indicates that the lode is generally, within the limits stated above, fairly uniform; although across the strike th grade may change markedly, along the strike changes appear to be gradual. A fairly abrupt fall in grade occurs, however, at approximately 4600N.

Possibility of Concealed Deposits.

The regional structure around Mt. Philp is not considered to be favourable to repetitions c the Mt. Philp type of deposit. In any case non-outcropping bodies of ironstone in this locality are not likely to be of any value for a long time, because even with high-grade ore the distance o haulage would make extraction by other than open-cut methods uneconomic.

Possibly some of the small isolated high-grade outcrops along the western flank of the Mt Philp deposit may enlarge at depth. This could only be tested by drilling.

Deleterious Associated Elements.

Analysis by the Queensland Government Analyst of six selected samples show that phosphorus, manganese, and titanium are all present in such small proportions as not to be serious impurities. The analyses are given on p. 13.

Strength of the Wall Rock.

The wall-rock on either side of the lode, so far as it was observed (it is very poorly exposed near the outcrop), appears to be fairly strong and lacking obvious planes of parting. It would probably stand well if left unsupported by quarrying and mining of the ironstone.

Greater trouble would probably be encountered in selective mining of the deposit itself, owing to the "blocky" nature of the material.

ESTIMATE OF TONNAGES

METHOD OF SAMPLING.

Sample lines were roughly laid out by chain ahead of the plane-table survey, at intervals of 200 feet along the strike. No serious attempt was made to correct for slope, sag, or obstructic Sample lines were subsequently plotted on the plane-table sheets and their distances apart determined.

Chip samples of uniform size were taken along the sample line at distances apart of 1 – 2 inches.

Many sample lines were not continuous across the strike. This was due, firstly to the steepness of many of the outcrop faces, and secondly to the time required to uncover ironstone in places where it was lightly covered with rubble. Care was taken, however, not to show ironstone on the plan or sections unless there were reasonable grounds for believing that ironstone lay und the rubble. Average sample length cut was 47.5 feet and the average width of cross-section of lode is 85 feet, so that only 56% of the cross-sections are represented by samples.

ASSAY RESULTS.

All assay determinations were made by the Queensland Government Analyst, Brisbane.

Sample No.	Cross-Section No.	Approximate Co-ordinate No.	Length of Sample cut in feet.	Width of Lode in feet.	Analysis (percent)	
					Fe.	SiO_2
G.S.Q.280	1	11,150	36	36	58.6	14.5
281	2	10,955	9	18	Sample lost in grinding.	
282	3	10,760	36	65	56.0	18.0
283	4	10,550	51	63	53.0	21.5
284	5	10,350	32	35	53.6	20.2
* 285	5	10,350	32		54.5	21.8
286	6	10,175	54	76	56.5	18.7
287	7	9,980	50	85	52.0	25.0
288	8	9,790	76	124	50.1	26.9
289) †	9	9,580)	75	170	41.7	28.9
290)		)				
291	10	9,395	41	46	58.5	14.6
292	11	9,200	41	41	59.4	13.8
293	12	9,025	46	46	52.2	24.6
294	13	8,835	41	41	48.8	28.8
295	14	8,650	55	67	50.3	26.9
296	15	8,485	57	57	49.6	28.2
* 297	15	8,485	57	57	48.9	27.8
298	16	8,295	71	83	55.8	18.2
299	17	8,080	48	100	38.9	41.9
300	18	7,880	65	136	47.2	30.6
301	19	7,800	30	72	41.1	39.9
302	20	Not accurately known	—	—	39.0	42.6
303	21	7,250	13	44	45.3	34.4
304	22	7,035	57	85	56.4	18.2
305	23	6,880	24	38	62.5	9.0
306	24	6,690	21	98	56.3	18.3
307	25	6,470	44	152	33.1	50.4
* 308	25	6,470	44	152	28.1	57.8
309	26	6,270	46	128	44.1	33.0
310	27	6,075	87	118	39.5	40.1
311	28	5,890	62	102	54.4	20.3
312	29	5,710	70	170	42.3	34.6
313)		)			47.9	29.3
314) †	30	5,500)	155	239	46.5	31.3
315)		)			55.9	16.6
316) †	31	5,320)	104	180	47.1	31.4
317)		)			42.7	38.4
318	32	5,110	29	96	49.3	28.6
319	33	4,910	64	93	51.3	26.0
320	34	4,730	54	76	53.6	22.3
321	35	4,540	32	39	26.0	60.0
* 322	35	4,540	32	39	25.3	61.4

Sample No.	Cross-Section No.	Approximate Co-ordinate No.	Length of Sample cut in feet.	Width of Lode in feet.	Analysis (percent)	
					Fe.	SiO_2
G.S.Q.323	36	4,360	40	93	42.3	37.5
324	37	4,140	33	98	42.8	37.0
325	38	3,950	23	87	37.3	45.5
326	39	3,755	35	55	30.4	56.2
327	40	3,570	29	61	29.6	57.3
328	41	3,370	41	41	32.4	51.5
329	42	3,145	21	21	33.0	51.5
330	43	2,930	58	96	26.1	60.5
331	44	2,775	36	56	33.5	51.2
332	45	2,650	31	64	29.8	55.6
* 333	45	2,650	31	64	32.0	53.0
334	46	2,450	72	72	33.5	49.8
335	47	2,260	30	45	30.2	53.2
336	48	2,090	53	110	27.1	59.6
337)	49	1,890)	80	80	58.0	16.6
338)		)			19.3	69.8
339	50	1,585	22	63	32.8	51.7
340	51	1,550	50	96	19.5	70.1
341	52	1,710	45	66	20.8	68.9
342	53	1,515	34	69	20.7	68.9
343) †	54	1,415	108	121	29.2	57.8
344)					31.7	45.2
345) †	55	1,220	124	257	28.6	57.0
346)					26.3	60.7
* 347)	55	1,220	124	257	29.0	58.0
348)					30.4	55.3
349	56	1,050	30	30	38.2	42.4
350	57	870	52	63	26.9	59.5
351	58	700	18		49.8	26.8
352	59	600	12		30.7	54.7
353	60	300	28		43.5	36.8
354	61	150			43.5	36.8
355	62	420			36.3	46.9
356	63	660			55.1	21.2
357	64	2,900			58.6	16.5
358	65	3,850			61.0	12.5

* Check sample taken from freshly broken surfaces only.

† Sectional samples cut from one sample line; length of each sample not recorded.

Analysis for Deleterious Impurities.

Sample No.	Phosphorus % (P)	Sulphur % (S)	Manganese % (Mn)	Titania % (TiO_2)
G.S.Q.286	0.03	0.012	0.006	0.13
295	0.02	Less than 0.01	0.005	0.27
306	0.05	0.012	0.005	0.30
318	0.03	Less than 0.01	0.006	0.39
329	0.03	0.011	0.018	0.43
351	0.03	0.016	0.019	0.21

CALCULATIONS.

Assumptions and Methods.

In calculating the volumes of the various grades the following assumptions have been made :

1. The area of cross-section at outcrop level continues at depth;

2. The samples represent the iron content present throughout the full width of the lode, irrespective of whether the sample cut was continuous or not – see p.10 Method of Sampling;

3. The iron content continues unchanged below the sample line, and laterally to points midway between the sample line under consideration and the adjoining sample lines on both sides.

The volume of exposed ironstone represented by each sample was obtained by multiplying the area of cross-section above the level of the base of the outcrop of the lower side of the cross-section by half the distance between the two adjoining cross-sections. *

No allowance has been made for ironstone which occurs as scree because, except for large boulders, it is rarely more than a few inches thick. Probably no more than 100,000 tons of recoverable displaced ironstone would be lying on scree slopes.

In order to calculate tonnage three specimens of ironstone of widely differing grade were collected, and their specific gravities determined. They were then assayed for iron and silica and a graph constructed to give the specific volume for each of the grades for which calculations have been made. In converting volume to tonnage the specific volume appropriate to the weighted average grade of the group under consideration was used.

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* *This has resulted in different average grades being obtained for the "exposed" ironstone and the non-outcropping ironstone. In calculating the grade of the former the irregular outline in longitudinal section has introduced a "weighting" factor which is absent from the calculations of the latter, the volume of which is expressed in tons per vertical foot.*

Results.

(a) **Exposed ironstone** (as defined in the previous section) :

(1) **All grades** :

Total tonnage or ironstone exposed (excluding isolated outcrops). .... Average content 36.6% Fe., 39.3% SiO_2.	4,110,000 tons

(2) **By grades** :

Tonnage of exposed ironstone assaying :—

Greater than 55% Fe. (Average grade 57.1% Fe.,17.1% SiO_2.; specific volume 7.8 cubic feet/ton) :	354,000 tons
50 – 55% Fe. (Average grade 51.6% Fe.,24.0% SiO_2.; specific volume 8.2 cubic feet/ton) :	753,000 tons
45 – 50% Fe. (Average grade 47.9% Fe.,29.9% SiO_2.; specific volume 8.5 cubic feet/ton) :	557,000 tons
40 – 45% Fe. (Average grade 42.4% Fe.,35.75% SiO_2.; specific volume 8.9 cubic feet/ton) :	1,186,000 tons

(3) **By bulk distribution** :

Tonnage of exposed ironstone north of Fountain Head Creek. .... Average content 51.1% Fe., 25.7% SiO_2.	385,000 tons
Tonnage of exposed ironstone between Fountain Head Creek and a point 800 feet south of Mt. Philp peak (where there is a sharp fall in grade). .... Average content 46.3% Fe., 31.1% SiO_2.	2,365,000 tons
Tonnage in main lode north of point 800 feet south of Mt. Philp peak. .... Average content 46.9% Fe., 30.4% SiO_2.	2,750,000 tons
Tonnage of exposed ironstone in isolated outcrops .... Average content approximately 55% Fe., 21% SiO_2.	70,000 tons

(b) **Non-exposed ironstone.**

(1) **All grades** :

Tonnage per vertical foot of whole deposit, except isolated bodies. .... Average grade 41.8% Fe., 38.3% SiO_2.	105,200 tons

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* *All weights are in long tons of 2240 lbs.*

(2) **By grade :**

Tonnage per vertical foot of ironstone assaying :–

Greater than 55% Fe. (Average grade 57.2% Fe., 16.7% SiO_2.)	14,700 tons
50 – 55% Fe. (Average grade 51.2% Fe., 24.6% SiO_2.)	22,000 tons
45 – 50% Fe. (Average grade 48.0% Fe., 30.1% SiO_2.)	12,700 tons
40 – 45% Fe. (Average grade 43.0% Fe., 36.0% SiO_2.)	17,900 tons

(3) **By bulk distribution :**

Tonnage per vertical foot of main lode north of Fountain Head Creek. Average grade 52.9% Fe., 22.9% SiO_2.	18,200 tons
Tonnage per vertical foot of main lode between Fountain Head Creek and a point 800 feet south of Mt. Philp peak (where there is a sharp fall in grade). Average grade 47.1% Fe., 30.6% SiO_2.	52,500 tons
Tonnage per vertical foot in main lode north of a point 800 feet south of Mt. Philp. Average grade 48.5% Fe., 28.7% SiO_2.	70,000 tons
Tonnage per vertical foot in isolated outcrops. Average grade 54.8% Fe., 21.3% SiO_2.	2,900 tons

CONCLUSIONS

Having regard to the location of the deposit, with the long haulage of ironstone to any prospective smelter, the high capital outlay in access roads or railway, and the comparative small tonnage of ironstone available, it is considered that the overall grade of iron is too low to justify exploitation in the immediate future.

The high silica content makes the ironstone unattractive for smelter treatment, but titanium, sulphur, manganese, and phosphorus are within acceptable limits.

If the northern portion of the deposit were worked by opencut methods, engineering difficulties would be encountered owing to the linear arrangement of the deposit and its topography. As the grade changes fairly uniformly, non-selective bulk-mining methods could be used. The width of the lode falls below 40 feet in a few places only. The country rock should be strong enough to allow sizeable faces to stand without support.

Before any systematic exploitation took place a more comprehensive sampling should be undertaken involving the clearing of rubble to permit full-width sampling of the lode and diamond drilling to test the grade and width of the lode at depth.

RECOMMENDATION

It is recommended that no further action be taken, either to obtain additional information by more detailed sampling and drilling, or to develop the deposit.

ACKNOWLEDGEMENTS

Acknowledgement is made of the services rendered by the Queensland Government Analyst, Brisbane, who carried out all the assays and analyses included in this report.

Mineragraphic work performed by W.M.B. Roberts of the Bureau of Mineral Resources (whose report is included as an appendix), facilitated the study and assessment of this deposit.

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APPENDIX

MINERAGRAPHIC EXAMINATION OF IRON OXIDE SPECIMENS

FROM MT. PHILP, QLD.

by

W.M.B. Roberts *

The specimens submitted by E.K. Carter for mineragraphic examination consisted mainly of massive iron oxide and silica.

Eight sections were cut from the six samples submitted. The description of the individual specimens in reflected light is given below.

Specimen R.6720.

The iron oxides present in this section are hematite and magnetite. The magnetite occurs as euhedral crystals up to 2.0 mm. across. These crystals show ample evidence of their alteration to martite, both along the crystal boundaries and along the octahedral planes of the magnetite, giving the crystals a grid-like appearance. Many areas of hematite enclose residual grains of magnetite. Small irregular grains of hematite 0.3 to 0.03 mm. in size occur throughout the section; many of them show a typical lamellar twinning. Much of the magnetite shows an anomalous anisotropism, and etches only slightly with hot HCl, indicating the presence of titanium in solid solution.

This section differs radically from the others examined in that it is composed mainly of iron-stained, partly altered orthoclase felspar with varying amounts of plagioclase felspar, epidote, quartz, chlorite, apatite, biotite and magnetite. It has an average grain size of 0.1 mm. and a granitic texture.

The name microgranite is appropriate for a rock having this mineral assemblage, texture and grain size. **

Specimen R.6715.

The iron oxide in this specimen is entirely hematite which occurs in thin veinlets, coalescing in places to irregular areas ranging in size from 5 mm. to 1 cm. The veinlets themselves are composed of fine-grained hematite, the grain size ranging in size from 0.03 mm. to 0.15 mm. Very few of the grains show lamellar twinning.

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* *Mineragrapher, Bureau of Mineral Resources, Canberra.*

** *Hatch, Wells and Wells "Petrology of the Igneous Rocks".*

The only gangue mineral in the section is quartz, which occurs as a recrystallised mass of of evenly-sized grains which measure 0.06 mm. across, and have a mosaic texture. The section is cut by veins of coarse-grained quartz, the grain size of which ranges from 0.3 to 1.8 mm. across. These veins have sharply defined edges and have been fractured in places, the fractures being filled with iron oxide. (Fig. 1). They contain residual areas of fine-grained recrystallised quartz and appear to have been introduced into cracks in the fine-grained mass of the rock. The major part of the iron minerals occurs in the fine-grained area, probably because it offers a greater surface area for reaction with mineralising solutions.

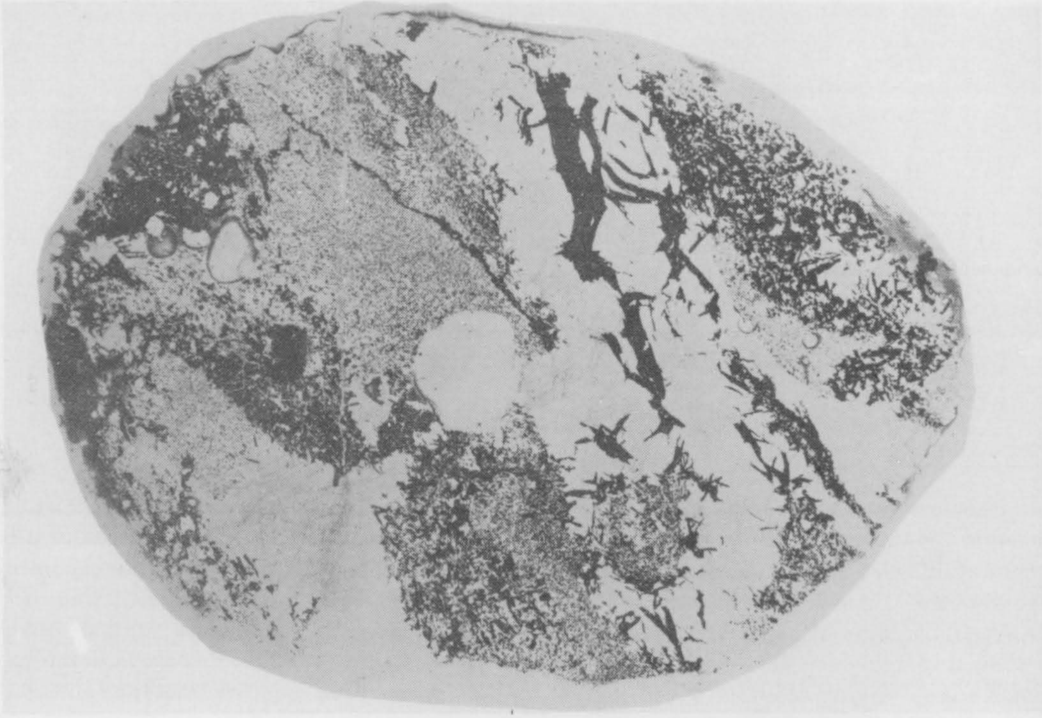

Fig.1 – Specimen A7193, showing deposition of iron governed by grain-size of quartz, and along fractures in later vein quartz. Crossed nicols, X13.

Specimen R.6716.

Hematite is the only iron oxide present in this section, occurring as irregular areas from 0.06 mm. to 0.3 mm. The grain size ranges from 0.06 mm. to 0.09 mm. Most of the grains show lamellar twinning, and are located in the interstices between grains of the quartz gangue. Quartz is the only gangue mineral; it has a hornfels texture and a grain size ranging from 0.05 mm. to 0.6

Specimen R.6717.

This specimen consists entirely of hematite of very coarse grain size (5 mm.). Perfect lamellar twinning is evident on all grains.

Examination of the thin section revealed no trace of any gangue minerals.

Specimen R.6718.

This specimen is also entirely hematite and quartz occurring as a granular aggregate, the grain size ranging from 0.1 to 0.3 mm. The lamellar twinning shown by the grains in the section consists of lamellae arranged at 70° to each other, giving a lattice appearance to the grains.

Quartz is the only gangue mineral present in the section; it occurs intergrown with the iron oxide as irregular grains, the majority of which have an average grain size of 0.06 mm. The remainder, which form approximately 10% of the total quartz, measure from 0.2 to 0.45 mm. across.

The finer-grained mass has the typical even grain size and mosaic texture of the recrystallised material, which was not observed in the coarser grained areas, indicating that the latter material is the younger.

Specimen R.6719.

The only iron oxide present in this section is hematite, occuring as grains ranging from 0.1 mm. to 0.5 mm., all showing a well-developed lamellar twinning.

Only one small area of quartz gangue was evident in the thin section of this specimen. It measured 1.0 mm. across and consisted of interlocking grains which averaged 0.05 mm. across.

DISCUSSION

With the exception of specimen R.6720, the only iron oxide present in the ore is hematite, which is shown by micro-chemical tests to contain traces of titanium. With the exception of one section, all the grains exhibit a very well-developed lamellar twinning. The lamellae are completely disoriented from one grain to the next, and are probably formed as the result of mutual interference of the grains during growth, and not as the result of some external stress.

As described earlier, the magnetite crystals in specimen R.6720 show alteration to hematite (var. martite), which could be due to the influence of heat; but there is no proof of this.

The presence of titanium in solid solution with the magnetite suggests a high temperature of formation for this mineral, indicating that it is of primary rather than secondary origin.

There is no trace of any chalcedony or opaline silica in the thin sections examined. The specimens were collected from the surface of the deposit, which strongly indicates the lack of any secondary surface silicification of the orebody.

The examination revealed two generations of quartz: the fine-grained recrystallised material, and the later coarse-grained vein quartz which has intersected it.

Carter has noted that the iron has replaced a banded quartzite on the western edge of the deposit.

That the period of iron mineralisation post-dates both quartz periods is indicated by the fact that iron oxide fills fractures in the coarse quartz veins, and that its general deposition has been governed almost entirely by the grain size of the quartz gangue.

This, coupled with the facts that:

quartz is abundant in these specimens, and no other non-opaque mineral is present;

the iron is considered to be epigenetic;

suggests that the ore was formed largely by replacement of a quartz sandstone, although no traces of bedding or other depositional features have been found in the specimens examined.

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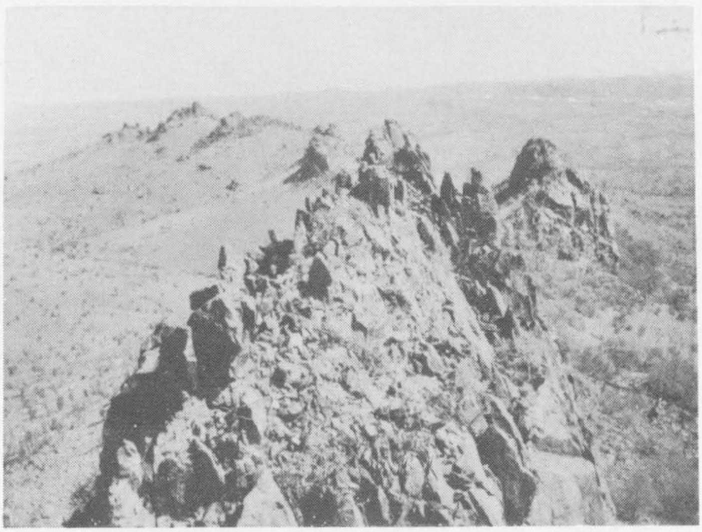
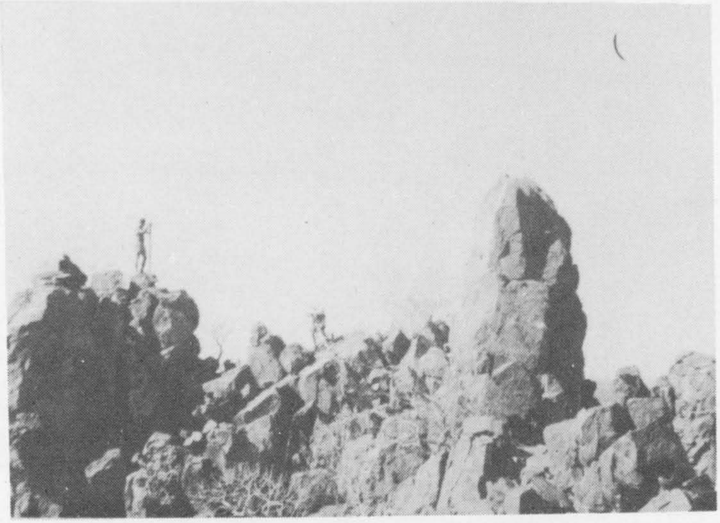
MAIN BLOCK OF MT. PHILP RANGE
FROM SOUTH OF ROCKY GULLY.



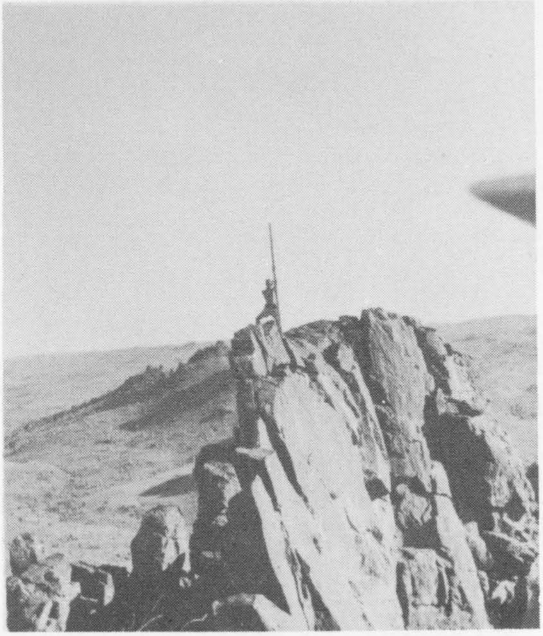
VIEW ALONG DEPOSIT, LOOKING SOUTH
FROM NEAR MT. PHILP.

PLATE 1.

VIEWS OF MT. PHILP IRON DEPOSITS
SHOWING NATURE OF OUTCROP.



OUTCROP NEAR MT. PHILP



DEPOSIT NEAR MT. PHILP LOOKING NORTH.

PLATE 1A.

VIEWS OF MT. PHILP IRON DEPOSITS SHOWING NATURE OF OUTCROP.

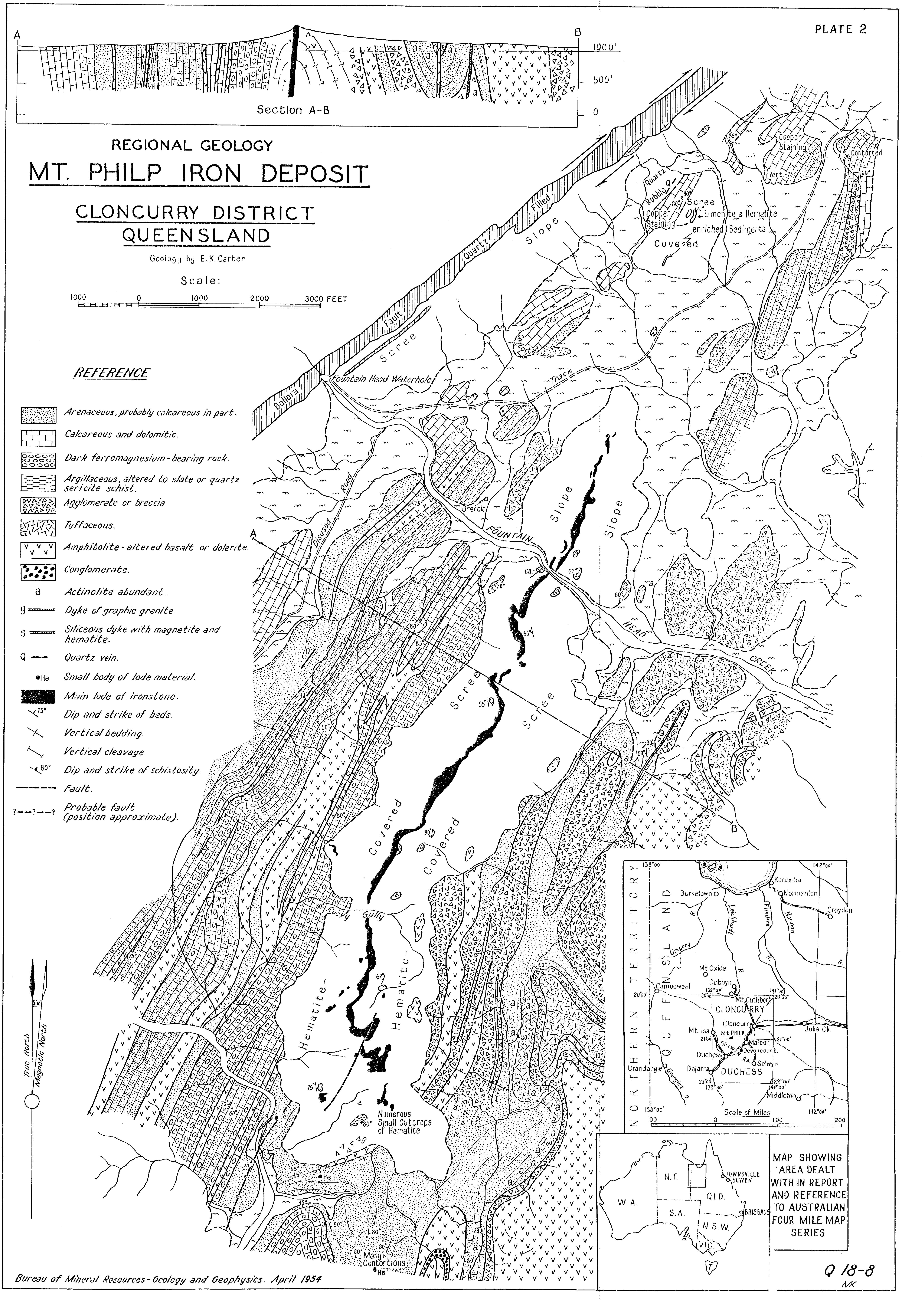


PLATE 2
A
B
1000'
500'
0
Section A-B
REGIONAL GEOLOGY
MT. PHILP IRON DEPOSIT
CLONCURRY DISTRICT
QUEENSLAND
Geology by E.K. Carter
Scale:
1000 0 1000 2000 3000 FEET
REFERENCE
Arenaceous, probably calcareous in part.
Calcareous and dolomitic.
Dark ferromagnesium-bearing rock.
Argillaceous, altered to slate or quartz sericite schist.
Agglomerate or breccia
Tuffaceous.
Amphibolite - altered basalt or dolerite.
Conglomerate.
a Actinolite abundant.
g Dyke of graphic granite.
S Siliceous dyke with magnetite and hematite.
Q Quartz vein.
He Small body of lode material.
Main lode of ironstone.
75° Dip and strike of beds.
Vertical bedding.
Vertical cleavage.
80° Dip and strike of schistosity.
Fault.
?--?--? Probable fault (position approximate).
True North
Magnetic North
5°30'
Ballara Fault Quartz Filled
Scree
Fountain Head Waterhole
Track
Slope
Quartz Rubble
Copper Staining
Scree
Limonite & Hematite enriched Sediments
Covered
Copper Staining
Contorted
Vert.
Contorted
Disused Road
Breccia
FOUNTAIN HEAD CREEK
Slope
Slope
Scree
Scree
Covered
Covered
Rocky Gully
Hematite-
Hematite-
Numerous Small Outcrops of Hematite
Many Contortions
A
B
138°00'
142°00'
Karumba
Normanton
Croydon
Burketown
Leichhardt
Flinders
Norman
R.
Gregory
NORTHERN TERRITORY
QUEENSLAND
Mt. Oxide
Dobbyn
Camooweal
20°00'
139°30'
141°00'
Mt Cuthbert
CLONCURRY
Cloncurry
Julia Ck.
Mt. Isa
Mt PHILP
Malbon
21°00'
SELWYN RA.
Devoncourt
Duchess
Selwyn
Dajarra
DUCHESS
Urandangie
Georgina R.
22°00'
139°30'
22°00'
141°00'
Middleton
138°00'
142°00'
100 0 100 200
Scale of Miles
N.T.
W.A.
QLD.
S.A.
N.S.W.
VIC.
T.
TOWNSVILLE
BOWEN
BRISBANE
MAP SHOWING AREA DEALT WITH IN REPORT AND REFERENCE TO AUSTRALIAN FOUR MILE MAP SERIES
Bureau of Mineral Resources - Geology and Geophysics. April 1954
Q 18-8

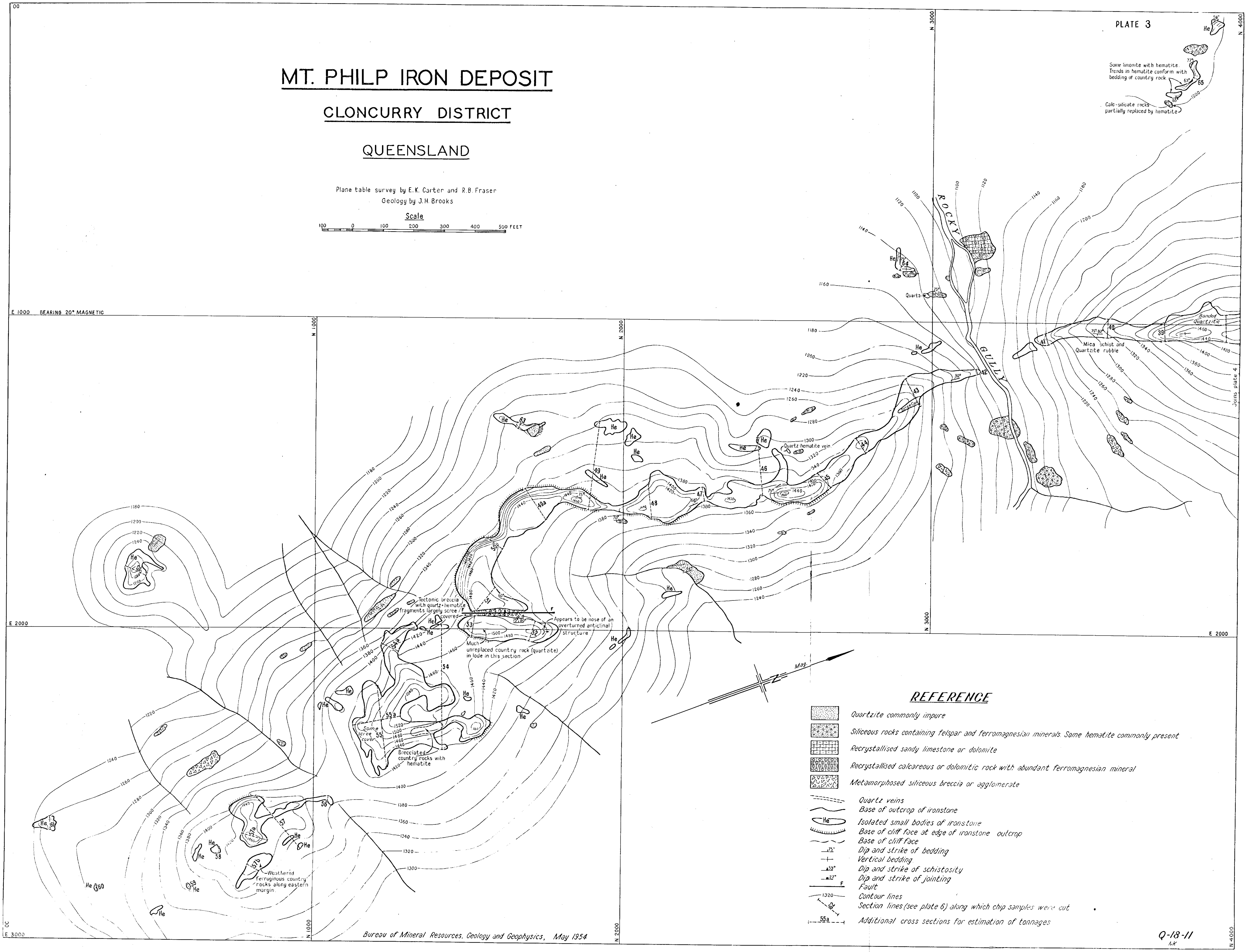


PLATE 3
MT. PHILP IRON DEPOSIT
CLONCURRY DISTRICT
QUEENSLAND
Plane table survey by E.K. Carter and R.B. Fraser
Geology by J.H. Brooks
Scale
100 0 100 200 300 400 500 FEET
E 1000 BEARING 20° MAGNETIC
N 1000
N 2000
N 3000
N 4000
E 2000
E 3000
ROCKY GULLY
Some limonite with hematite. Trends in hematite conform with bedding of country rock
Calc-silicate rocks partially replaced by hematite
Quartz
Quartz-hematite vein
Mica schist and Quartzite rubble
Banded Quartzite
Joins plate 4
Tectonic breccia with quartz-hematite fragments largely scree covered
Appears to be nose of an overturned anticlinal structure
Much unreplaced country rock (quartzite) in lode in this section
Some scree cover
Brecciated country rocks with hematite
Weathered ferruginous country rocks along eastern margin
He
Mag.
REFERENCE
Quartzite commonly impure
Siliceous rocks containing felspar and ferromagnesian minerals. Some hematite commonly present
Recrystallised sandy limestone or dolomite
Recrystallised calcareous or dolomitic rock with abundant ferromagnesian mineral
Metamorphosed siliceous breccia or agglomerate
Quartz veins
Base of outcrop of ironstone
Isolated small bodies of ironstone
Base of cliff face at edge of ironstone outcrop
Base of cliff face
Dip and strike of bedding
Vertical bedding
Dip and strike of schistosity
Dip and strike of jointing
Fault
Contour lines
Section lines (see plate 6) along which chip samples were cut
Additional cross sections for estimation of tonnages
Bureau of Mineral Resources, Geology and Geophysics, May 1954
Q-18-11

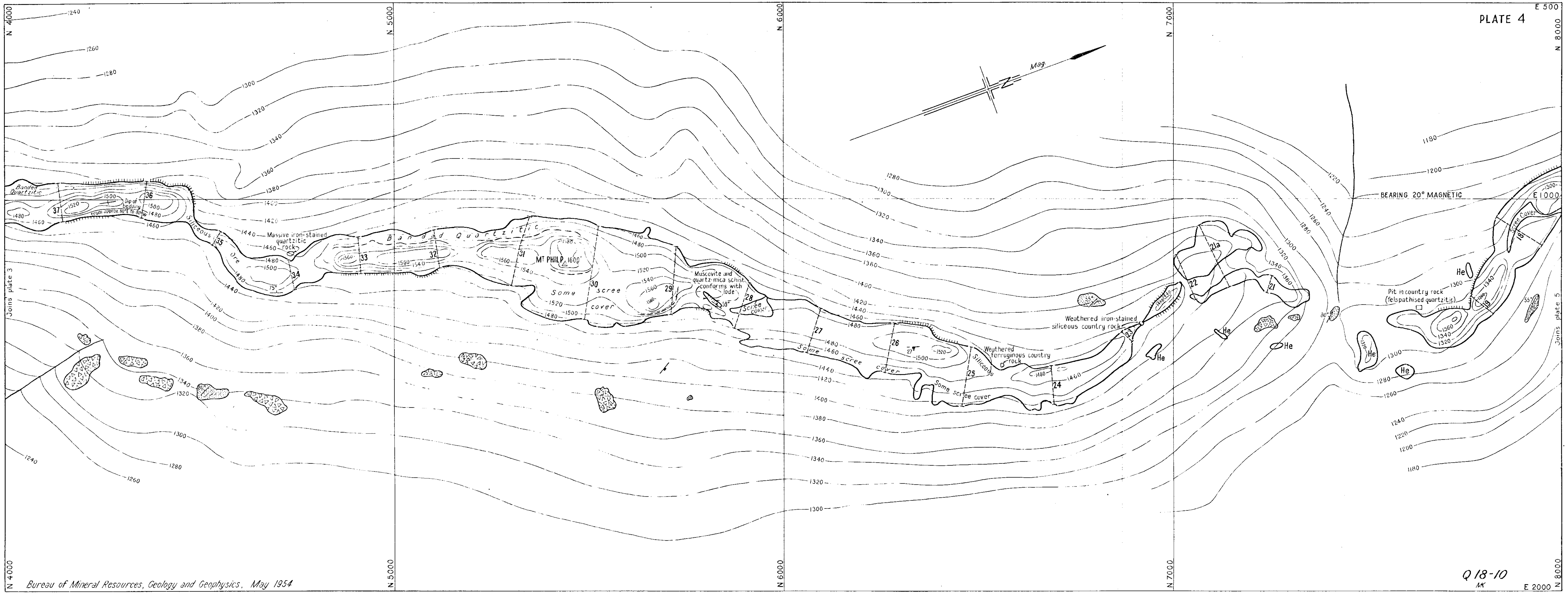
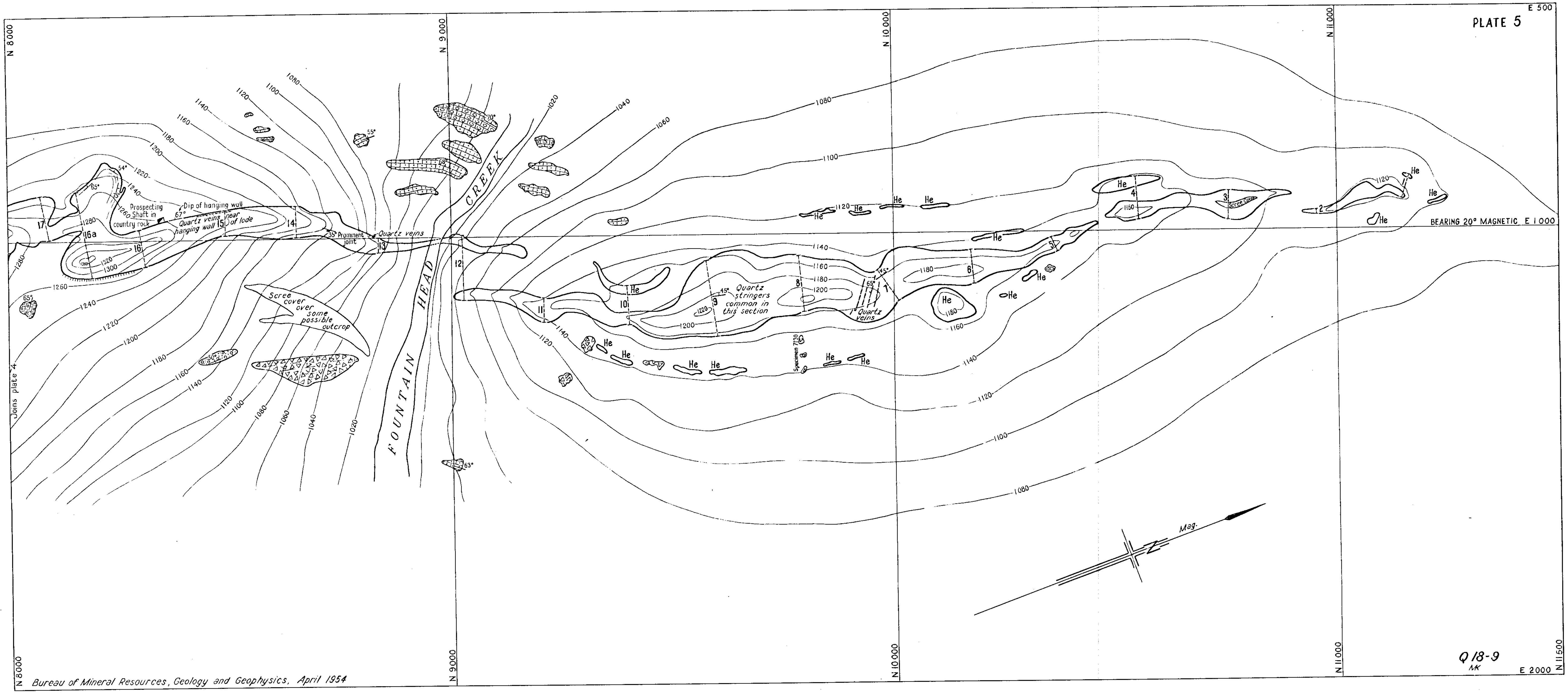


PLATE 4
Mag
BEARING 20° MAGNETIC
Banded Quartzitic
Dip of bedding from approx 80° E to 80° W
Siliceous Ore
Massive iron-stained quartzitic rock
Banded Quartzitic
M^t PHILP 1600'
Some scree cover
Muscovite and quartz-mica schist conforms with lode
Scree cover
Some scree cover
Siliceous
Weathered ferruginous country rock
Some scree cover
Weathered iron-stained siliceous country rock
Pit in country rock (felspathised quartzitic)
Scree Cover
Joins plate 3
Joins plate 5
N 4000
N 5000
N 6000
N 7000
N 8000
E 500
E 1000
E 2000
Bureau of Mineral Resources, Geology and Geophysics, May 1954
Q 18-10

PLATE 5



Bureau of Mineral Resources, Geology and Geophysics, April 1954

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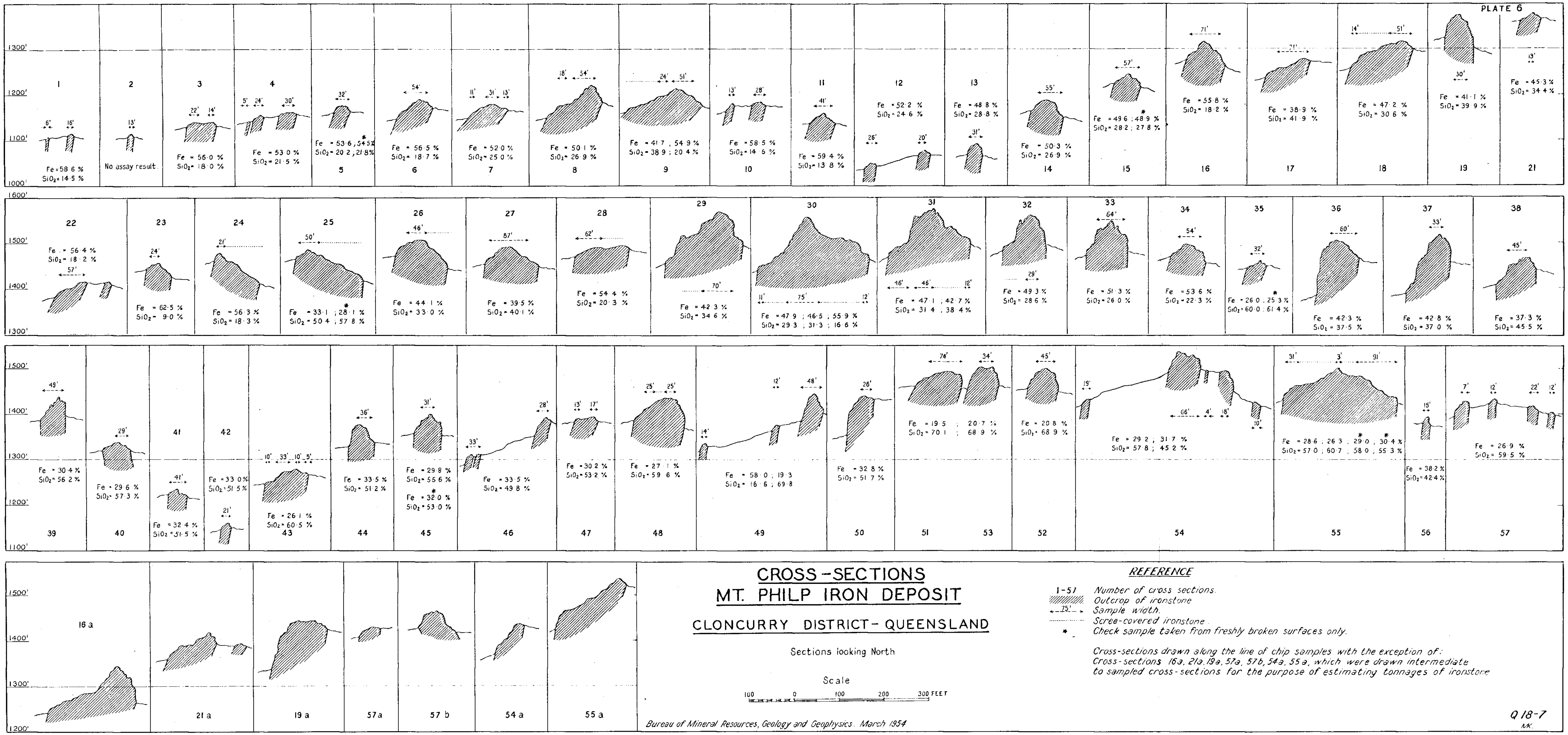

PLATE 6
1300'
1200'
1100'
1000'
1
Fe = 58·6 %
SiO2 = 14·5 %
2
No assay result
3
Fe = 56·0 %
SiO2 = 18·0 %
4
Fe = 53·0 %
SiO2 = 21·5 %
5
Fe = 53·6 ; 54·5 %
SiO2 = 20·2 ; 21·8 %
6
Fe = 56·5 %
SiO2 = 18·7 %
7
Fe = 52·0 %
SiO2 = 25·0 %
8
Fe = 50·1 %
SiO2 = 26·9 %
9
Fe = 41·7 ; 54·9 %
SiO2 = 38·9 ; 20·4 %
10
Fe = 58·5 %
SiO2 = 14·6 %
11
Fe = 59·4 %
SiO2 = 13·8 %
12
Fe = 52·2 %
SiO2 = 24·6 %
13
Fe = 48·8 %
SiO2 = 28·8 %
14
Fe = 50·3 %
SiO2 = 26·9 %
15
Fe = 49·6 ; 48·9 %
SiO2 = 28·2 ; 27·8 %
16
Fe = 55·8 %
SiO2 = 18·2 %
17
Fe = 38·9 %
SiO2 = 41·9 %
18
Fe = 47·2 %
SiO2 = 30·6 %
19
Fe = 41·1 %
SiO2 = 39·9 %
21
Fe = 45·3 %
SiO2 = 34·4 %
1600'
1500'
1400'
1300'
22
Fe = 56·4 %
SiO2 = 18·2 %
23
Fe = 62·5 %
SiO2 = 9·0 %
24
Fe = 56·3 %
SiO2 = 18·3 %
25
Fe = 33·1 ; 28·1 %
SiO2 = 50·4 ; 57·8 %
26
Fe = 44·1 %
SiO2 = 33·0 %
27
Fe = 39·5 %
SiO2 = 40·1 %
28
Fe = 54·4 %
SiO2 = 20·3 %
29
Fe = 42·3 %
SiO2 = 34·6 %
30
Fe = 47·9 ; 46·5 ; 55·9 %
SiO2 = 29·3 ; 31·3 ; 16·6 %
31
Fe = 47·1 ; 42·7 %
SiO2 = 31·4 ; 38·4 %
32
Fe = 49·3 %
SiO2 = 28·6 %
33
Fe = 51·3 %
SiO2 = 26·0 %
34
Fe = 53·6 %
SiO2 = 22·3 %
35
Fe = 26·0 ; 25·3 %
SiO2 = 60·0 ; 61·4 %
36
Fe = 42·3 %
SiO2 = 37·5 %
37
Fe = 42·8 %
SiO2 = 37·0 %
38
Fe = 37·3 %
SiO2 = 45·5 %
1500'
1400'
1300'
1200'
1100'
39
Fe = 30·4 %
SiO2 = 56·2 %
40
Fe = 29·6 %
SiO2 = 57·3 %
41
Fe = 32·4 %
SiO2 = 51·5 %
42
Fe = 33·0 %
SiO2 = 51·5 %
43
Fe = 26·1 %
SiO2 = 60·5 %
44
Fe = 33·5 %
SiO2 = 51·2 %
45
Fe = 29·8 %
SiO2 = 55·6 %
Fe = 32·0 %
SiO2 = 53·0 %
46
Fe = 33·5 %
SiO2 = 49·8 %
47
Fe = 30·2 %
SiO2 = 53·2 %
48
Fe = 27·1 %
SiO2 = 59·6 %
49
Fe = 58·0 ; 19·3
SiO2 = 16·6 ; 69·8
50
Fe = 32·8 %
SiO2 = 51·7 %
51
Fe = 19·5 ; 20·7 %
SiO2 = 70·1 ; 68·9 %
53
52
Fe = 20·8 %
SiO2 = 68·9 %
54
Fe = 29·2 ; 31·7 %
SiO2 = 57·8 ; 45·2 %
55
Fe = 28·6 ; 26·3 ; 29·0 ; 30·4 %
SiO2 = 57·0 ; 60·7 ; 58·0 ; 55·3 %
56
Fe = 38·2 %
SiO2 = 42·4 %
57
Fe = 26·9 %
SiO2 = 59·5 %
1500'
1400'
1300'
1200'
16 a
21 a
19 a
57 a
57 b
54 a
55 a
CROSS-SECTIONS
MT. PHILP IRON DEPOSIT
CLONCURRY DISTRICT - QUEENSLAND
Sections looking North
Scale
100 0 100 200 300 FEET
REFERENCE
1-57 Number of cross sections.
Outcrop of ironstone
Sample width.
Scree-covered ironstone.
* Check sample taken from freshly broken surfaces only.
Cross-sections drawn along the line of chip samples with the exception of: Cross-sections 16a, 21a, 19a, 57a, 57b, 54a, 55a, which were drawn intermediate to sampled cross-sections for the purpose of estimating tonnages of ironstone
Bureau of Mineral Resources, Geology and Geophysics. March 1954
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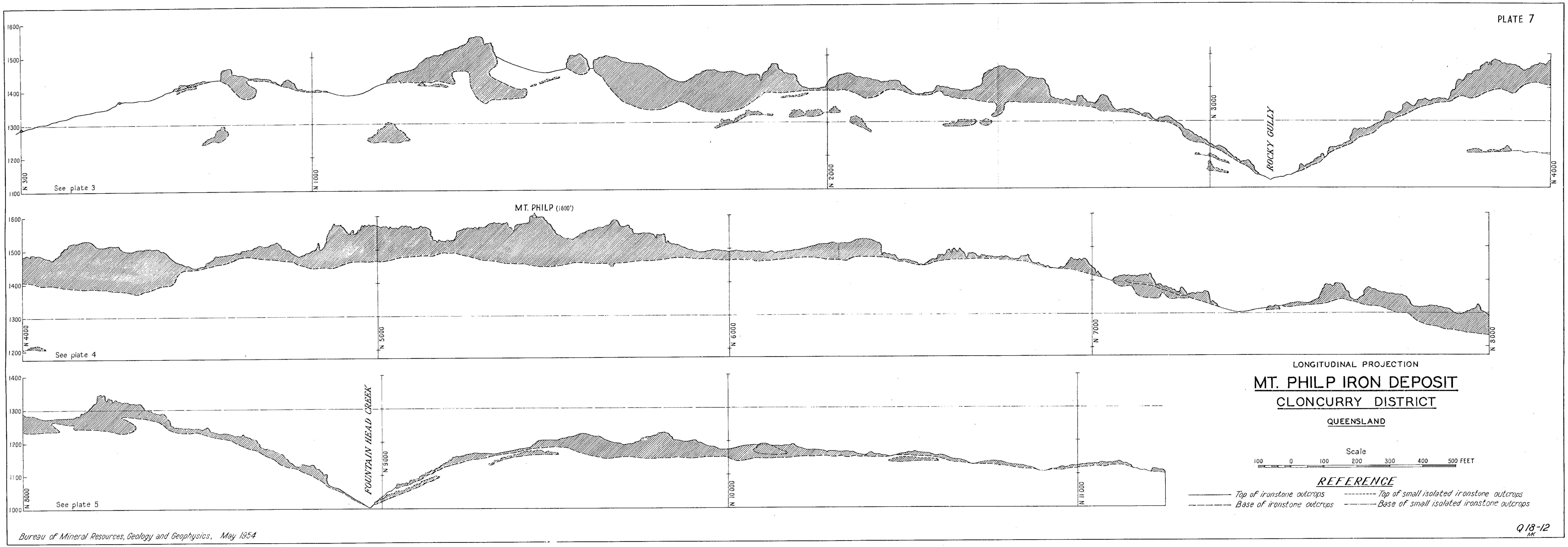
PLATE 7
1600
1500
1400
1300
1200
1100
N 300
N 1000
N 2000
N 3000
N 4000
ROCKY GULLY
See plate 3
MT. PHILP (1600')
N 4000
N 5000
N 6000
N 7000
N 8000
See plate 4
FOUNTAIN HEAD CREEK
N 8000
N 9000
N 10 000
N 11 000
1000
See plate 5
LONGITUDINAL PROJECTION
MT. PHILP IRON DEPOSIT
CLONCURRY DISTRICT
QUEENSLAND
Scale
100 0 100 200 300 400 500 FEET
REFERENCE
Top of ironstone outcrops
Base of ironstone outcrops
Top of small isolated ironstone outcrops
Base of small isolated ironstone outcrops
Bureau of Mineral Resources, Geology and Geophysics, May 1954
Q18-12
MK