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- GEOLOGICAL REPORT ON THE MOUNT MURPHY WOLFRAM MINE -

Report No.1943/65

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ACCOMPANYING PLANS

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GEOLOGICAL REPORT ON THE MOUNT MURPHY WOLFRAM MINE.

Report No.1943/65.

INTRODUCTION.

Situation: The Mount Murphy wolfram deposits are situated in the Parish of Indi, County of Benambra, in northeastern Victoria. The principal reefs outcrop on the northwestern slope of Mount Murphy, between 4,200 and 4,600 feet above sea level, but other reefs are found right to the top of Mount Murphy itself, the elevation of which is about 5,100 feet. By road the mine is about 32 miles in a northeasterly direction from Benambra township, which is 15 miles from Omeo. The first half of this road is moderately good, but the last 16 miles exceedingly bad, in part boggy and in part very steep and mountainous, and some sections are practically impassable during the winter months.

Timber adequate for mining purposes is plentiful near the mine, and water for milling, mining and other requirements is readily available.

Mapping: Four days, from November 1st to 5th, were spent at the mine. The surface in the vicinity of the reefs was mapped by plane table and the underground workings by compass and tape. A survey plan prepared by P.E.Clarke on a scale of 50 feet to an inch was used as a base and consequently the plans prepared are drawn to that scale. The results of the mapping are presented in two plans, of which Plate 1 shows the surface and the underground workings, with approximate contours at 20' intervals, and includes a locality plan, and sections through the reefs, and Plate 2 comprises longitudinal sections of the Nos.1, 2, 3, 4 and 5 reefs.

History and Production: The field is said to have been discovered about 1890. During the years 1907 to 1912 the Benambra Wolfram Syndicate worked the mine and extracted the ore on the main reef above the No.1 adit. The Mount Murphy Wolfram Company, which was formed subsequently, drove the No.2 adit and mined out the payable ore above this level, and did a small amount of work on the other reefs, some of which were also worked in a small way by prospecting parties. After 1920 no work was done on the field until it was re-opened in the middle of 1942 under the direction of the Controller of Minerals Production.

E.J.Dunn of the Victorian Geological Survey reported on the occurrence of wolfram at Mount Murphy in 1906 (records of the Geological Survey of Victoria, Vol.2, Pt.2, pp.120-121). In 1919 J.G.Easton, also of the Victorian Geological Survey, prepared a plan on the workings, including a longitudinal section of the main orebody. The following table gives the production and value of the wolfram concentrates (estimated as 65 per cent. WO_3) recorded from the field.

TABLE 1. MOUNT MURPHY PRODUCTION.

Year	Tons	Value £
1908	3	252
1909	14	1,432
1910	18.5	1,954
1911	17.25	1,070
1912	5.05	464
1913	.6	49
1914	Nil	Nil
1915	5.0	712
1916	Nil	Nil
1917	20.25	3,300
1918	1.1	193
1919	Nil	Nil
1920	3.3	175
Total -	88.05	£9,601

GEOLOGY

The reefs occur in metamorphosed slate and sandstone, probably of Ordovician age, about ¼ mile north from an intrusive granite contact which runs in an easterly to southeasterly direction. The degree of contact metamorphism decreases gradually away from the granite and in the vicinity of the reefs is only moderate, original sandstone beds being silicified and partly converted to quartzite, while the shale has the spotted appearance characteristic of incipient development of contact metamorphic minerals. The strike of the series is fairly constantly northwest, with minor variations on either side of this direction, and the dip southwest, usually at 45 degrees, though in places the angle is less, and in the main adit gentle folding is in evidence.

ECONOMIC GEOLOGY

General: The Mount Murphy reefs can conveniently be divided into three groups, the No.1 or main reef, the No.2 reef series, and the Upper Mount Murphy reefs. Nearly all past production has come from the No.1 reef. No.2 reef is the one which has previously been referred to as the 'Barrow' or No.4 reef, developed by No.4 adit. No.3 reef is that exposed in the No.3 adit, and Nos. 4 and 5 are adjacent parallel reefs. These four reefs are all narrow, strike north-south and dip vertically or steeply east. The Upper Mount Murphy reefs occur near the summit of the mountain, 1,600 to 3,000 feet southeast of No.1 reef and at 500 to 600 feet greater elevation. These also are narrow steeply dipping veins, striking north-northeast, more or less parallel to the No.1 reef.

Structural Features: The principal structural features of the field are:

(1) The reef fissures, which are probably faults of small displacement. These strike nearly at right angles to the granite contact, north in the more westerly group of reefs, north-northeast in the main reef, and north-northeast to nearly northeast in the upper reef group. All dip steeply to the east.

(2) Northeast striking faults. These dip at varying angles but the two main strong fault zones observed, one at 200 feet in the No.2 adit and the other at 340 to 350 feet in the main adit, both dip southeast at 60 to 65 degrees.

(3) The bedding of the sedimentaries, striking northwest and dipping southwest at 45 degrees.

(4) Strong jointing in the sedimentaries, striking northwest to north-northwest and dipping northeast at 50 to 60 degrees. This jointing is particularly prominent near reefs or faults.

The reefs themselves are very little affected by faulting as the few faults which cut the reefs in the present workings are of small displacement only.

No.1 Reef: No.1 reef strikes north-northeast and dips east at angles varying from 65 to 90 degrees. The outcrop ranges from 55 feet above the level of the No.1 adit (R.L. 4440') at the north end, to 115 feet at the south end, and the reef was stoped out above this level in the years 1908 to 1912. The length worked at the surface was 240 feet and at No.1 level about 230 feet. Victorian Mines Department records show that 1,500 tons of ore were stoped from this section for a return of 59.6 tons of wolfram concentrates, equivalent to 2.66 per cent. WO_3. The area of the stoped ground shown on the longitudinal section, Plate 2, is 17,300 square feet, hence, assuming 14 cubic feet per ton, the average width of reef mined was about 15 inches. Faces exposed nearly all show greater width than this but contain very little wolfram, hence unless the ore was picked in the stopes there is a strong suggestion that the sections of the reef which carried good values were narrower than the barren areas. E.J. Dunn in describing the outcrop, which was then exposed over a length of 200 feet, reports it to have been 15 inches wide at the north end, 2 feet wide in the middle and 18 inches at the south end.

The No.2 adit was driven in 1915 by the Mount Murphy Wolfram Company to cut the reef 105 feet below the No.1 adit but the length of stopable ore was found to have decreased on this level to only 100 feet. During 1915, 5 tons of concentrates were produced from ore, presumably from the No.2 adit level drive, which was reported to average 1 - 1½ per cent. wolfram. This company stoped out the payable ore above the level for a return in 1917 of 20.25 tons of wolfram concentrates. In a half-yearly report written in 1917 the manager stated that 401 tons, comprising 252 tons of ore, 139 tons of mullock and 10 tons of tailings, returned 6½ tons of wolfram concentrates containing 65 per cent. WO_3. The ore was broken from the No.2 level and probably carried about 2 per cent. wolfram. Although the full details of the stoping in this section are not known, the minimum area that could have been stoped is nearly 8,000 square feet (refer longitudinal section, plate No.2). At an average width of 15 inches the amount of ore stoped is 715 tons and at 2 feet, 1,144 tons, corresponding respectively to 1.9 per cent. and 1.2 per cent. WO_3. The width of the exposed faces suggests that the latter figure is the more correct. In either case there appears to be an appreciable drop in grade from the average in the No.1 level stopes. From these figures it appears that 1.5 per cent. WO_3 is the maximum figure which can be assumed for the average recoverable grade of the ore below the No.2 level.

At the north end the reef pinches out, in places making into another lens, before dying out altogether (see level plans, Plate 1). At the south end the ore gives way to barren white quartz. The reef is at present exposed on the surface at the south end, in the south end of No.2 level, and in old stopes which have been reopened above the No.2 level. On the surface it can be seen in two pillars and in the end of the open cut, varying in width from 14 to 33 inches, and is practically barren. At the south end of the No.1 level, to which an entry was effected by the Mine Manager through old stopes, it is 20 inches wide and contains little wolfram. On No.2 level in the south drive the reef is exposed for 50 feet, ranging in width from 15 to 36 inches, and consisting of barren white quartz. In the south end of the stopes above it is 24 inches wide

and practically barren, while in a pillar above the intermediate level it is 30 to 36 inches wide and contains a little wolfram, probably less than 1 per cent. WO_3. The poor values in this section are obviously responsible for its having been left. At the time of mapping a drive was being put in on the intermediate level north through the old stopes in the hope of picking up ore beyond the stoped area.

The longitudinal section shows a decided pitch of the ore shoot to the south, which is much more pronounced on the under side than on the top. This pitch is towards the granite contact and generally parallel to the intersection of the bedding of the country rock with the plane of the reef. Operators on the field maintain that hard quartzitic wall rock such as that exposed in the north end of the No.2 adit drive is unfavourable to ore, and it is possible that this has determined the flat pitch of the bottom side of the ore shoot in the No.1 reef. The steeper pitch on the upper surface of the shoot may be related to the drop in temperature gradient with increasing distance from the granite contact. A combination of these two factors is adequate to account for the shape of the orebody. If these relative pitches continue to operate below the No.2 adit level the ore would cut out at a depth of about 135 feet, with consequently limited ore reserves below the level.

At 363 feet in the No.2 adit, 143 feet from the footwall of the main reef, a narrow reef of similar strike and dip was cut. This was driven on for 40 feet south and found to range up to 13 inches in width but the wolfram content is low. Some tourmaline was observed to be present.

Ore Reserves - No.1 Reef: It is obvious that all the ore has been stoped out above the No.1 level and it is most improbable that any ore would have been left above the No.2 adit level. In 1917, at the time this ore was being worked, the operating company had their stoping system and their arrangements for the transport of ore fully developed, and a milling plant in operation. For the three subsequent years the price of wolfram was about 55/- per unit, higher than it had ever been before, and just half the present price. Operating costs at that time were probably not more than half the present costs and therefore ore which would be payable now would have been payable then. Hence it is conceivable that the company would have left any ore above the No.2 level. This is confirmed by inspection; the south end of the reef is everywhere barren or nearly so, and the one small pillar which has been left for 30 feet below the No.1 level over a length of 15 feet carries only low values, not more than 1 per cent. WO_3. The ore cuts out at the north end - it is not faulted - and it seems certain that it would have been stoped above the level to the limit of payable values. Below the level the most generous estimate that can be allowed is to assume that the ore dimensions on No.2 level continue down, say to the horizon of the main adit level. A more conservative estimate would be obtained by assuming that the relative pitches of the top and bottom of the ore shoot, as illustrated in the longitudinal section, are maintained below the level, resulting in the ore cutting out at a depth of 135 feet. This would be the correct procedure in making calculations upon which to base estimates. A further possibility is that another ore shoot may exist at a lower horizon but this is purely hypothetical. The following table sets out the ore reserve position.

TABLE 2. ORE RESERVES - NO.1 REEF.

Positive Ore:	Length	Height	Average Width	Tonnage	Recoverable Grade
Above No.1 level -	[illegible]	[illegible]	[illegible]	Nil	-
Above No.2 level -	15'	30'	3'	100	<1% WO_3

Probable Ore:	Length	Height	Average Width	Tonnage	Recoverable Grade
Below No.2 level -	100'	$\frac{135'}{2}$	1'6"	720	1.5% WO_3 ?
Possible Ore:					
Below No.2 level to Main Adit Level	100'	235'	1'6"	2,500	1.5% WO_3 ?

No.2 Reef Group: There are half-a-dozen or more reefs altogether in this group, but only the four principal ones are described in detail. They are all narrow, seldom reaching a foot in thickness, and tailing off towards the ends. Their strike is within a few degrees of north-south and most of the reefs are fairly straight, though changes in direction are noticeable in some of the surface trenches. Maximum length of outcrop traced is less than 300 feet and the reefs are parallel or subparallel, and extend through the same horizontal range. The dip is steep to the east (see Section B-B[1], Plate 1) though in places it may be vertical or locally reversed. The occurrence of ore is erratic and seems to be confined to small irregular shoots, which may, however, contain patches of exceedingly high-grade ore. The stage of development is not sufficient to determine whether these reefs pitch to the south with the bedding of the sedimentaries in a similar manner to the No.1 reef, and the occurrence of quartz on the Main Adit level in the correct position for No.2 reef, but 100 feet north of the reef in the No.4 adit, suggests that this may not necessarily be the case, unless the lower reef is a separate vein.

No.2 Reef: This reef is exposed in the No.4 adit, previously known as 'Barrow' adit (this is 'Dejarlais' adit shown on J.G. Easton's plan), in a rise from the adit to the surface, and in a winze to the No.3 adit level 34 feet below. On the surface it has been underhand stoped to an unknown but probably fairly shallow depth over the length of 70 feet. (See longitudinal section, Plate 2). A small cut 25 feet north of the main open cut exposes 3 to 8 inches of quartz with a good wolfram content, but it is not clear whether this is the direct continuation of the No.2 reef or a parallel vein. In the adit it is 3 to 4 inches in width up to 56 feet from the portal, and then increases to an average of 7 to 8 inches for next 100 feet of its length. Towards the end of the adit it becomes narrower and tends to play out and come in again as narrow lenses. It is only one inch wide in the face of the adit, 198 feet from the portal. The rise and winze both showed an average thickness of 9 to 10 inches. Wolfram content of the reef is poor to 35 feet from the portal then good for a short distance and thereafter gradually decreasing. A sample of 100 lb. taken during development somewhere between 90 and 120 feet returned 17.5 per cent. WO_3. Good ore was obtained in both rise and winze, though that in the bottom 5 feet of the winze is not as good as the ore higher up.

A report dated May 19th, 1919 states that 4 tons of ore from Dejarlais lode returned 1,500 lb. concentrates, a return of 10.4 per cent. WO_3. This ore probably came from the underhand stope from the surface on the No.2 lode.

The drive was sampled in three sections by taking channel cuts across the reef at two-foot intervals and these were bulked as follows:

TABLE 3. SAMPLING RESULTS - NO.4 ADIT.

Sample No.	Distance from Portal	No. of Cuts	Average Width	% WO_3
No.1	35 - 51'	10	3.35"	2.05
No.2	51 - 94'	22	6.3"	1.0
No.3	100 - 142'	19	7.4"	0.55
Average -	107'	51	6.1"	0.91

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A six-foot gap was left at the bottom of the rise to the surface and another four feet in the No.3 sample could not be included because of the chamber which had been cut above the winze. A sample taken at the bottom of the winze, comprising three cuts across the reef on either side at 2, 5 and 8 feet above the level of No.3 adit, assayed 3.1 per cent. WO_3. Most of the wolfram in this sample came from the top cut on either side.

The reef cut in the drive off the main adit 145 feet below the level of the bottom of the winze (No.3 adit level) is also apparently the No.2 reef. At the time of examination this reef had been opened up for a length of 40 feet, and though little wolfram could be seen, it contains patches of scheelite which were estimated by visual inspection under ultra violet light as follows, beginning from the adit:

Distance in Feet	Width in inches	WO_3 Content %
0 to 8	4 to 8	Less than 0.2
8 to 18	6	2
18 to 27	2 to 8	Less than 0.1
27 to 30	0	Nil
30 to 31	6	3
31 to 36	4 to 6	Less than 0.1
36 to 40	8 to 9	1.5

The average value of the exposed reef on this estimate works out at a little under .8 per cent. WO_3.

The upper workings show that the distribution of ore in this reef is very irregular, being suggestive of shallow flat shoots pitching to the south. The drive on the main adit level will not come underneath the ore in the upper levels until it is extended 60 - 200 feet farther, and if the reef in general shows any southerly pitch more driving may be necessary to reach the ore zone on this level. It is unlikely in a small reef like this that an ore shoot, whose maximum known horizontal extent is only about 90 feet, should persist unchanged throughout an indefinite vertical extent, and a more likely condition is a series of shoots arranged possibly en echelon, particularly if as suggested above, drop in temperature away from the granite contact has had any effect upon the localization of ore deposition. The scheelite-bearing quartz already exposed in the drive off the adit may be part of such a shoot.

Ore Reserves - No.2 Reef: Table 4 gives the ore reserves on the No.2 reef, according to the information available.

TABLE 4. ORE RESERVES - NO.2 REEF.

	Length	Height	Av. Width.	Tonnage	Recoverable Grade
Positive Ore:					
Above No.4 adit -	90'	35'	7"	140	1% WO_3
Probable Ore:					
No.3 to No.4 adit -	90'	34'	7"	130	1.5% WO_3
Possible Ore:					
Main adit to No.3 adit-	90'	140'	7"	525	1% WO_3

The ore in the rise and winze is said to have been better than the average obtained by sampling for the level, and a

recoverable grade of 1.0 per cent. WO_3 has been adopted for the reef above No.4 adit and of 1.5 per cent. WO_3 for the reef from No.3 to No.4 adit levels. With regard to the section below No.3 adit level down to the main adit level it is only possible to assume that the average dimensions and grade of the ore at any horizon will be similar to those exposed in the No.4 adit.

No.3 Reef: This is the most easterly of the No.2 reef series and is best exposed in the No.3 adit, where very good wolfram values were obtained. It was also apparently cut in one of the drives from the old No.6 adit and in another short adit above (see longitudinal section, Plate 2), but contained little wolfram in those workings. The outcrop higher up the hill has been trenched for a length of 65 feet, but not stoped to any depth as far as can be ascertained. In the drive, the reef comes in at about 20 feet from the adit, but over the first 20 feet it is erratic in occurrence, varying up to 15 inches in width, but usually not more than 8 inches. Samples cut from this section returned .4 per cent. WO_3 for the first 10 feet and .4 per cent. WO_3 for another 9 feet, following a gap of 3 feet. The last 35 feet of the drive contain excellent ore, averaging 7 inches in width and 7.6 per cent. WO_3. This was sampled in 5 feet sections, with sample cuts at 15 inch intervals. Details of this sampling are shown in Table 5.

TABLE 5. SAMPLING RESULTS, NO.3 REEF.

Distance from Adit	Length of Sample	Sampling Interval	Number of Cuts	Assay Result WO_3
Feet	Feet	Inches		Per Cent.
28 - 38	10	24	4	0.4
41 - 50	9	18	6	0.4
50 - 55	5	15	4	2.7
55 - 60	5	15	4	15.4
60 - 65	5	15	4	1.5
65 - 70	5	15	4	9.0
70 - 75	5	15	4	7.2
75 - 80	5	15	4	8.25
80 - 85	5	15	4	10.1

The ore in the face at the time of examination was lean, except for a patch of wolfram at the top, but this may be only a local impoverishment, though the shoot will have to pitch very flatly south for the ore to persist any distance on this horizon, as the upper workings on the lode show very little wolfram. This lode or lode fissure has not yet been cut in the main adit.

Ore Reserves No.3 Reef: Not much ore is blocked out in this reef as neither the upper limit nor the southern limit to the shoot exposed in the No.3 adit is known and there are no workings below this adit level. If the shoot persisted to the surface at the dimensions in the drive, the ore above the level would amount to 75 tons. This figure is subject to variation due to greater length or lesser vertical extent of the shoot. As at present developed the dimensions of the level are equivalent to 1½ tons per vertical foot. For a short shoot in a small reef of this nature, it would not be sound practice to assume a depth of shoot greater than the length so a reasonable expectation of ore would be:-

Above the level - 26 tons at 7.6 per cent. WO_3

Below the level - 26 tons at 7.6 per cent. WO_3

This is subject to proportional increase according to the length of ore developed by further driving of the adit along the lode.

No.4 Reef: This reef has been stoped upwards from the No.6 adit, which is now collapsed and inaccessible. It has been traced on the surface by costeans and short adits for more than 250 - 215 feet, the greatest length of outcrop in the No.2 reef group. It is exposed in the inner 50 feet of No.7 adit, where it is 9 to 11 inches wide, but contains very little wolfram. Just north of the mouth of this adit (see longitudinal section, Plate 2), it has been stoped through to surface from No.6 adit over a length of 30 feet or so, and stoped underneath for a greater length. In the No.3 adit, it is probably represented by a 2 to 4 inch reef which is seen on the right-hand side of the drive about 10 feet from the adit, and also in the cross-cut to the bottom of the winze from No.4 adit. As the best ore in the shoot on this reef has presumably been stoped out, no ore reserves can be included, though it is probable that development would reveal other shoots.

No.5 Reef: This is a narrow reef exposed in the first half of No.7 adit and in sundry costeans and short drives. In No.7 adit, it gradually decreases in width from 5 inches at the portal and pinches out at 47 feet. It appears to have been stoped from the surface for a short distance near its northern end, but apart from this is not known to contain any payable ore. All exposures are very poor and it cannot be considered in any estimate of ore reserves, though it is possible, as in the case of No.4 reef, that local shoots of ore do exist.

Upper Reef Group: Several reefs are known to occur over an area 1,500 by 500 feet near the top of Mount Murphy (refer to 200 feet survey plan by P.E.Clarke). The longer dimension of this area is parallel to the granite contact and the individual reefs strike approximately at right angles to the contact, in a north-northeast to northeast direction. These reefs all seem to be narrow, less than 12 inches in width, and dip nearly vertically or slightly east. Most of them have been exposed by surface trenches only, though on the most easterly one a shaft has been put down from the surface and a little stoping done, in addition to extensive surface trenching. An adit driven to cut this reef apparently failed to locate payable ore. It is possible that some of the upper reefs may contain shoots of ore, but it is obvious that no very rich wolfram was exposed by the surface work or it would have been developed more vigorously. Hence the locating of such shoots would necessitate extensive prospecting.

Grade of the Ore: The sampling done should give a fairly close indication of the average grade of the reefs as at present developed. It is possible that the values obtained in places are a little lower than the true average, as some of the wolfram in these narrow reefs at shallow depths from the surface is friable and tends to come out on firing or cleaning down. For instance, patches of much higher grade ore than was obtained in the recent sampling are reported to have been met with in driving the No.4 adit. However, with sample cuts at regular intervals, spaced closely together, the average obtained cannot be far from the true value of the ore. Another reliable indication of the grade will be furnished by the results of the parcel of development ore which was being put through the mill at the time of inspection. The total quantity was 77 tons, comprising 44 tons from No.2 ('Barrow') adit, 23½ tons from No.3 adit and 9½ tons from the No.1 reef. The ore was clean, with little wall rock dilution - certainly not more than would be unavoidable in any system of mining narrow reefs. The amount from Nos.3 and 4 drives has been apportioned to the relative drives, rises and winzes and according to the sampling averages should contain:-

44	tons	at	1.30	per	cent.	WO_3	-	.58	tons	tungstic oxide.
23½	"	"	4.2	"	"	"	-	.99	"	" "
9½	"	"	1	"	"	"	-	.09	"	" "
77	Tons							1.66	Tons	

At 80 per cent. recovery, this should return 1.33 tons tungstic oxide or 2.04 tons of 65 per cent. WO_3 concentrates.

Occurrence of Scheelite: Most of the reef exposures were examined under ultra violet light but very little scheelite could be seen in any of the upper levels. In the No.2 reef in the main adit level however, scheelite is erratically distributed through the reef, the estimated grades being given on Page 6. The scheelite appears to have been formed by primary replacement of wolfram, though little wolfram now remains. It seems likely that in the narrow reefs at least the wolfram may give way to scheelite in depth as at the Phoenix mine, Frogmore. The exposures at Wymah on the lower level suggest that the reefs there may behave in a similar manner.

RÉSUMÉ OF ORE RESERVES

The following table summarises the ore reserve position:-

TABLE 6. ORE RESERVES - MOUNT MURPHY MINE.

6

REEF	LOCALITY	TONS	RECOVERABLE GRADE WO_3 %	WO_3 Tons	VALUE £A
Positive Ore:					
No.1 Reef	Above No.2 adit level	100	.7	0.7	385
" 2 "	" " 4 " "	140	1.0	1.4	770
" 3 "	" " 3 " "	26	6.0	1.56	858
		266		3.66	£2,013
Probable Ore:					
No.1 Reef	Below No.2 adit level	720	1.5	10.8	5,940
" 2 "	No.3 - No.4 " "	130	1.5	1.95	1,072
" 3 "	Below No.3 adit level	26	6.0	1.56	858
		876		14.31	£7,870
Total: Positive & Probable -		1132		17.97	£9,883
Possible Additional Ore:					
No.1 Reef	Below No.2 adit to main adit level.	1780	1.5 ?	26.71	14,685
" 2 "	Below No.3 adit to main adit level.	525	1.0 ?	5.25	2,887
" 3 "	Below No.3 adit to main adit level.	150 ?	6.0 ?	9.0	4,950
		2455		40.95	22,522
Total: Positive, Probable & Possible		3853		62.58	33,418

To this might be added a possible 100 to 200 tons of say 2 per cent. ore which might be developed in the Nos.4, 5 or other reefs in the No.2 reef group. No account is taken at present of the upper Mount Murphy group.

CONCLUSIONS AND RECOMMENDATIONS

The pre reserve position outlined on the previous page shows that there is very little chance of recovering the money invested in this mine, especially as it is very doubtful if the tonnage shown under "possible additional ore" will be realised. With regard to operating expenses, the maximum throughput in one 10-hour shift of the mill as at present worked is 10 tons, or 250 tons per month of 25 days. Allowing 200 tons per month to cover stoppages, cleaning-up, etc. and an average recoverable value of 1.5 per cent. WO_3 for the ore, the output would be 3 tons of tungstic oxide per month, worth £1,650. The operating expenses are at present put down as £1,700 per month. In view of these figures, it is essential that working expenses be kept to a minimum, and the following recommendations are made with that object:-

1. All work above No.2 adit be stopped immediately with the exception of mining out the small pillar above the intermediate level, and even this should not be persisted with if mill recoveries prove that it is not payable.

2. A winze be sunk on the No.1 lode at the point where the No.2 adit cuts the lode, to test the ore below the No.2 adit level.

3. The main adit cross-cut be stopped.

4. The main adit drive on No.2 reef be continued and, if it exposes a shoot of payable ore, a cross-cut be put out to test the other reefs at this place, for similar pitch factors will operate for all reefs and the relative positions of the ore zones in each reef at the lower level should correspond in a general way to those near the surface.

5. The No.2 adit be continued until the values cut out, and stoping above the level on No.3 reef commenced as soon as soon as possible.

6. The No.2 reef be driven on at No.3 level and stoped out to surface - this will give backs to an average height of 70 feet.

7. Sinking on No.2 reef be deferred until driving on the main adit level has outlined the probable pitch of the ore and indicated the most advantageous position for the winze.

8. All developmental work be placed upon a contract basis, as the present wages system has been found to be slow, costly and inefficient.

The only ore developed for stoping is the low grade pillar above the intermediate level on No.1 reef, containing about 100 tons. Even if this is found payable it will keep the mill running only for a fortnight or so, and it will be some months before the No.1 reef below the No.2 adit level is ready for stoping. Hence the Nos.2 and 3 reefs will have to supply the milling ore for the present, apart from development on the No.1 reef, and as neither of these reefs is prepared for stoping, it is obvious that the milling plant will not achieve maximum output for some time. This may be partly offset by the prospect of obtaining good returns when the high grade ore in No.3 reef is stoped.

SUMMARY

The Mount Murphy reefs occur in sedimentary rocks, which strike northwest and dip southwest at 45 degrees, about $\frac{21}{44}$ mile north from an intrusive granite contact. The reefs, which strike north to northeast and dip steeply east, can be divided into three groups -

the No.1 reef, the No.2 reef group and the Upper Mount Murphy group. No.1 reef has been practically worked out from the surface to No.2 adit level, 155-220 feet vertical dimension, average width 15 - 24 inches. The length of shoot decreased from over 200 feet on the surface to 100 feet on No.2 level. Average recoverable grade also apparently decreased from 2.66 per cent. WO_3 above No.1 level to less than 2 per cent. WO_3 between Nos.1 and 2 levels. The relative pitch of the top and bottom of the ore-shoot suggests that it may bottom at 135 feet below the No.2 level for a total ore content of 720 tons. Total possible ore (at No.2 level dimensions) to level of main adit, 235 feet below, is 2,500 tons.

No.2 reef is a narrow vein with localised shoots of ore, averaging in No.4 adit .91 per cent. WO_3 over 107 feet length and 6.1 inches width. Patches of higher grade ore were met with during development. Positive and probable ore amounts to 270 tons with a recoverable wolfram content equivalent to 3.35 tons tungstic oxide. Possible additional ore to main adit level is 525 tons.

On No.3 reef, high grade ore averaging 7.5 per cent. WO_3 and 7 inches wide has been driven on for 35 feet. Expectation of ore on present exposures is 52 tons, but subject to increase on further development.

Nos.4 and 5 reefs in the No.2 reef group and the Upper Mount Murphy reefs may contain shoots of ore but none is developed at present.

Total positive plus probable ore on present mine exposures adds up to 1,132 tons, containing 18 tons tungstic oxide worth £9,900. Possible additional ore is about 2,500 tons with a tungstic oxide content of perhaps 41 tons. There is little prospect of the capital invested being returned but the mine may pay operating costs if working expenses are kept to a minimum.

N. H. Fisher
CHIEF GEOLOGIST

CANBERRA.
26th Nov.,1943.

H. B. Owen
GEOLOGIST

PLATE I.

- PLAN -
MT. MURPHY WOLFRAM MINE
PARISH OF INDI
COUNTY OF BENAMBRA
VICTORIA

SHOWING UNDERGROUND WORKINGS AND INCLUDING CROSS-SECTIONS THROUGH THE NO.1 REEF & THE NO.2 REEF SERIES.

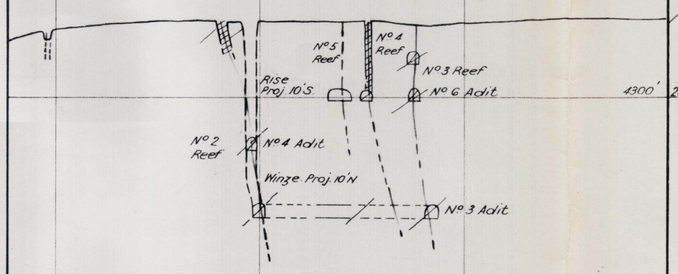
50 0 50 100 FT.

Reference

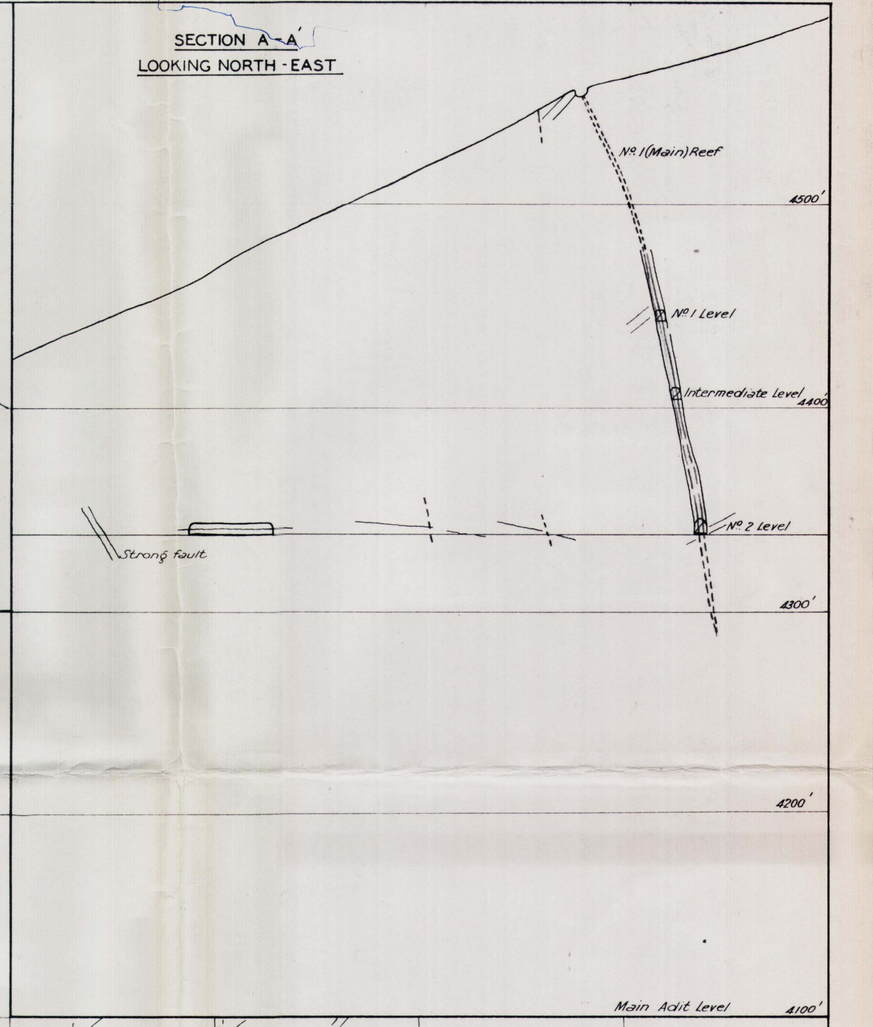
- Quartz reefs
- 70° Strike & dip of strata
- 60 Fault
- 50 Strong fracture or joint
- Costean
- Adit — Adit inaccessible
- Geology in underground workings shown by broken lines.
- Contours approximate heights above Sea level.
- B — B' Section Line

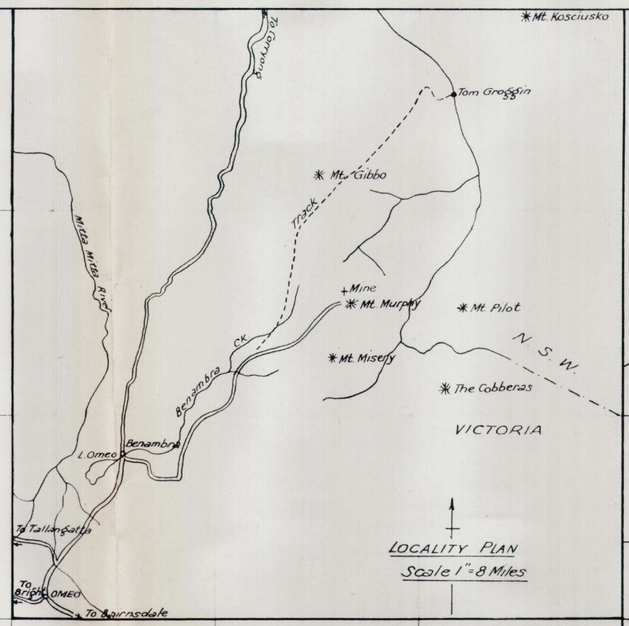
A.H. Fraser, Chief Geologist. A.B. Owen, Geologist.
Mineral Resources Survey Branch.
Nov 1943.

SECTION B-B'
ALONG COORDINATE 3100 N
LOOKING NORTH



SECTION A-A'
LOOKING NORTH-EAST





LOCALITY PLAN
Scale 1" = 8 Miles

987.

V8/3

LONGITUDINAL SECTIONS
MT. MURPHY WOLFRAM MINE

50 0 50 100ft.

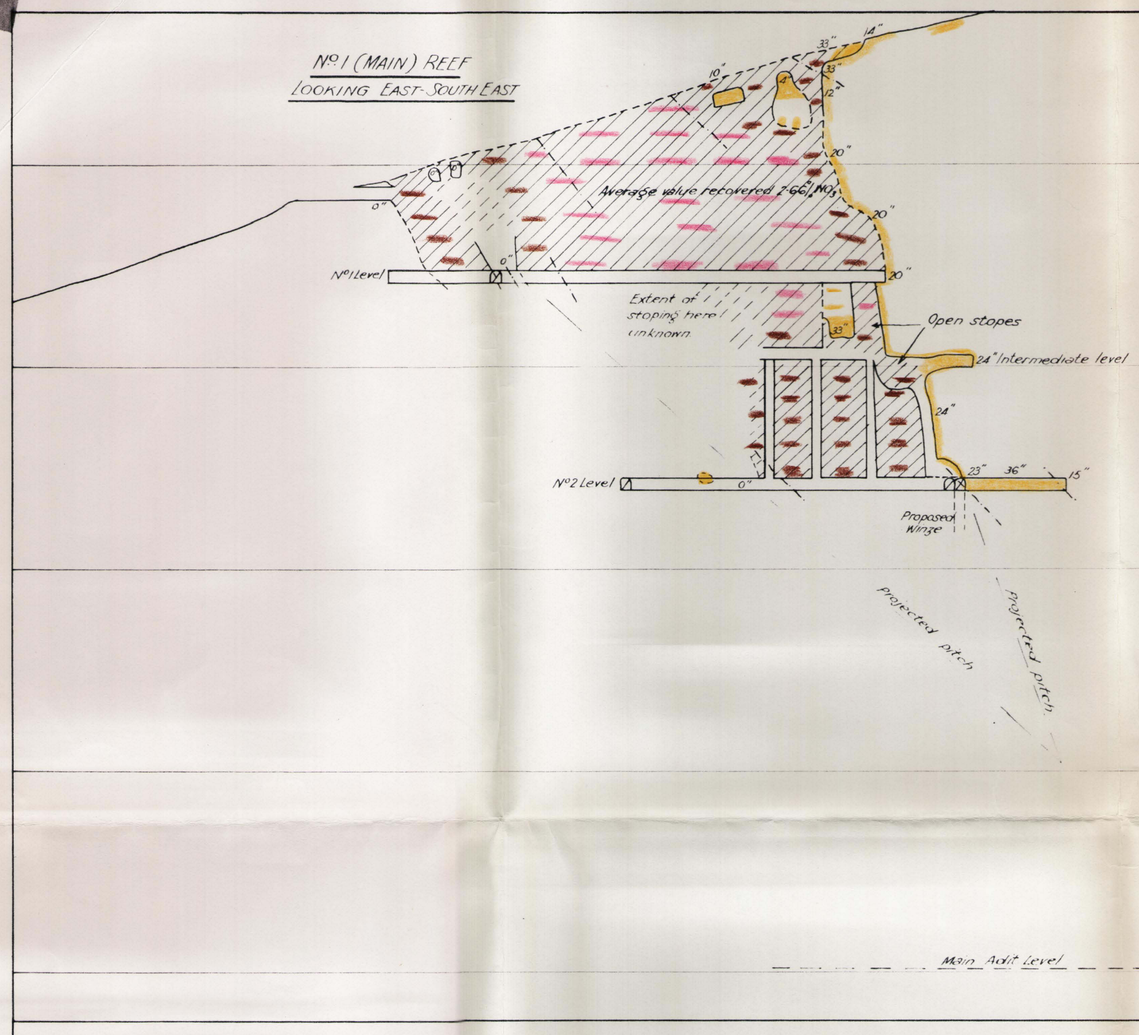
No 1 Reef is projected on to a vertical plane bearing 25°E
Nos 2,3,4 & 5 reefs are projected onto a north-south vertical plane.
Thickness of reefs shown in inches.
Levels & co-ordinates are taken from Survey Plan by P.E. Clarke
Workings shown by broken line are not on the reef.

—LEGEND—

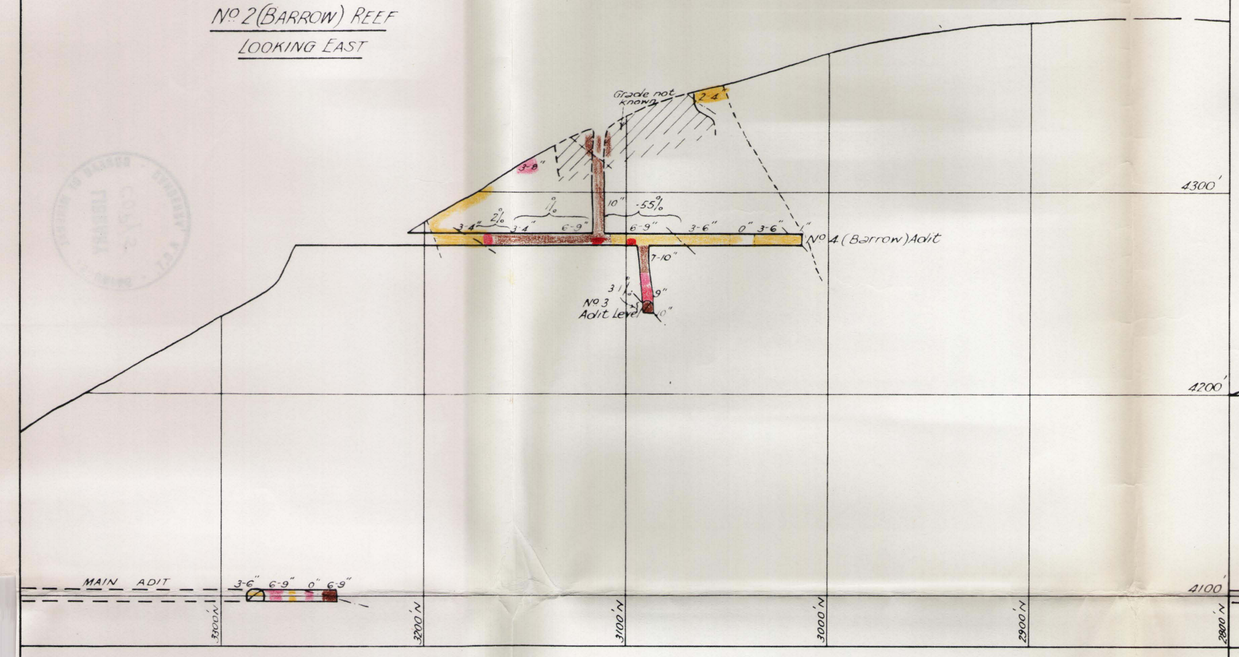
- Average value of ore > 3% WO_3
- " " " " 2-3% WO_3
- " " " " 1-2% WO_3
- " " " " < 1% WO_3
- Stoped
- Exact limits of stoping not known
- Intersection of bedding planes on plane of reef

M.H. Fraser, Chief Geologist.
K.B. Owen, Geologist.
Mineral Resources Survey Branch
Nov. 1943

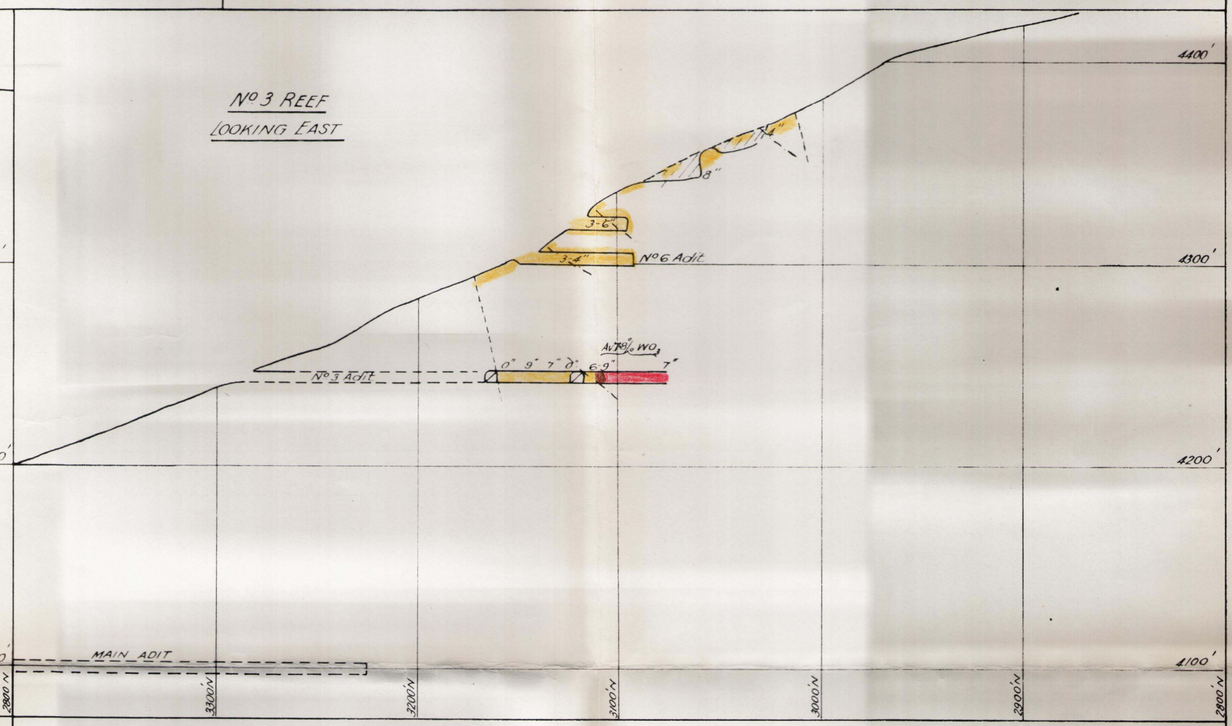
No 1 (MAIN) REEF
LOOKING EAST-SOUTH EAST



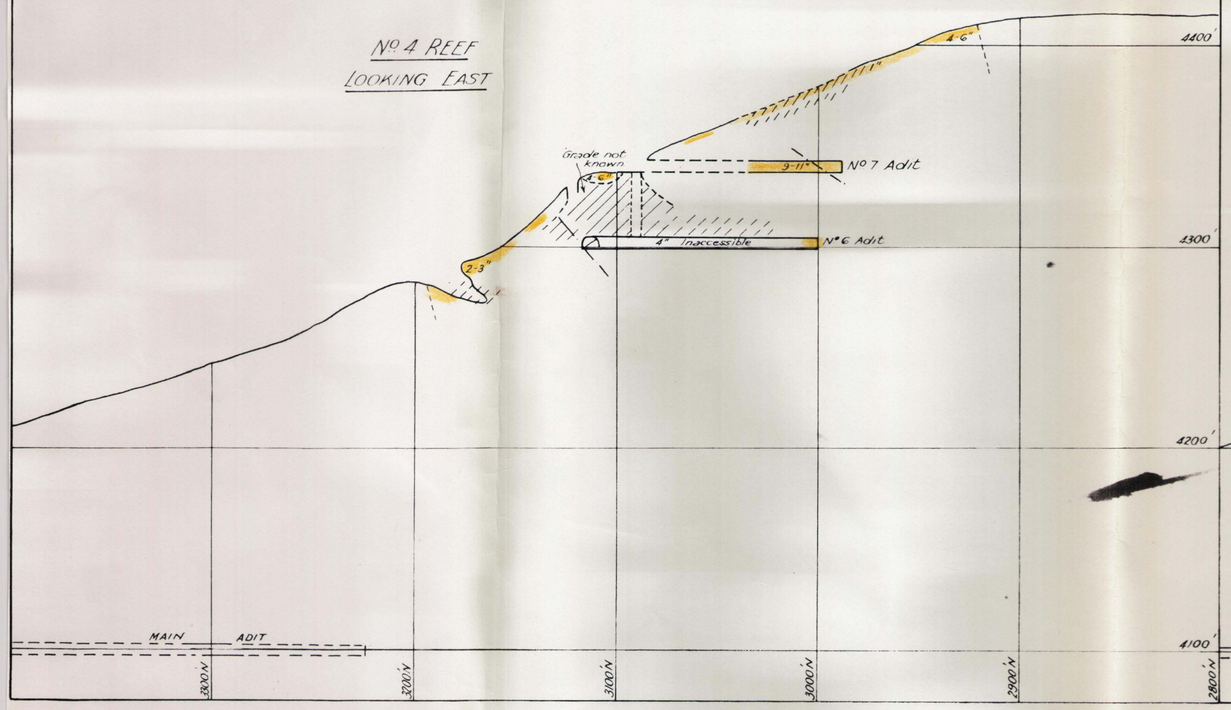
No 2 (BARROW) REEF
LOOKING EAST



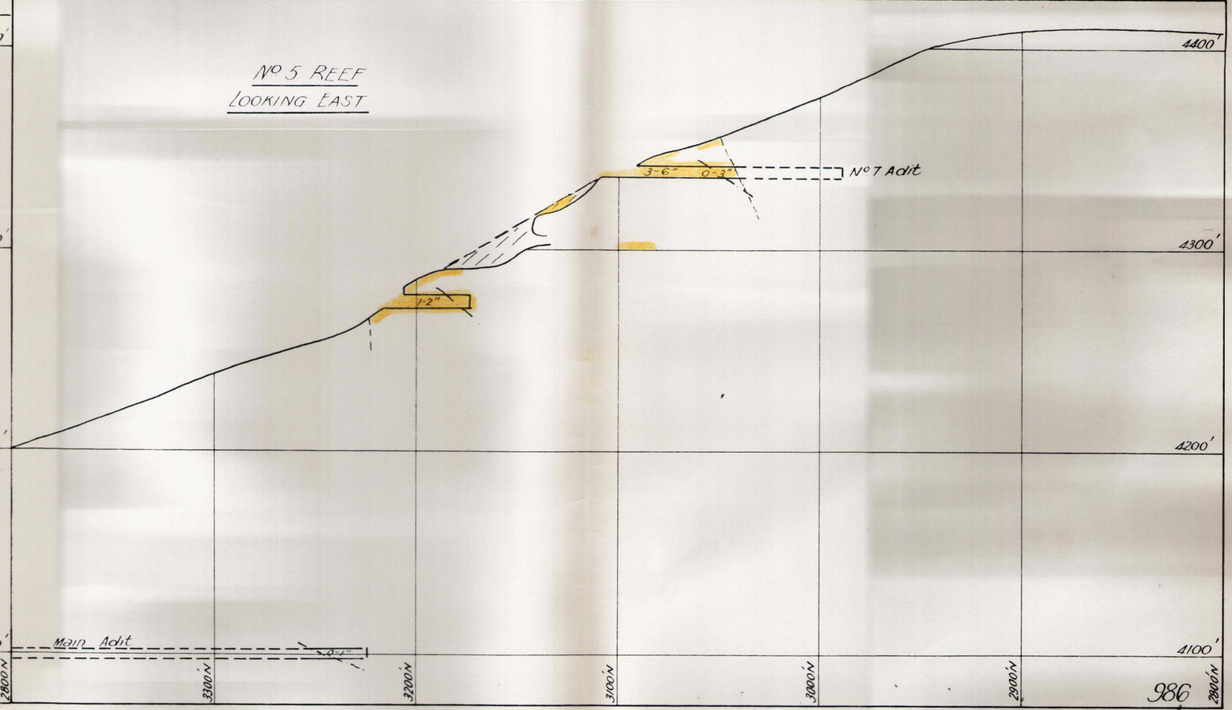
No 3 REEF
LOOKING EAST



No 4 REEF
LOOKING EAST



No 5 REEF
LOOKING EAST



986
V8/4