	CO			·	<del>logu a salipated A</del> a	<u> </u>	galantini a megalah kang	Asso	1y	(	ppm	1)			
Depth (m)	Geology E	Description	Sample No.	Depth	Thick- ness (m)	La	Се	Nd	Sm	Eu	Тb	Nb	Sr	Υ	Б
	88	Apatite, bastnaesite bearing dark brown to black sideritic cb	T1401.	0 00	2.40	8292	11476	2372	334.1	63.9	(0.1	524	42235	297	14123
2 40	    	Apatite, bastnaesite bearing white mdg sövite	T 1402	240	3. 80	2749	5049	1577	251.6	69.8	17.9	959	25020	373	18569
5 60 6 20 6 80 7 9 0	(60) (60) (60)	Fissure Drus y Fissure Sövite ( sideritic cb	T1403	6 20	4.20	2195	4224	1407	2372	66.6	40.4	2922	13091	397	21489
IO		Sövite > sideritic cb Apatite, bastmæsite, pyrochlore(?)		10 40							·-··				
		Sövite ≧ light brown ankeritic cb Apatite, bastnaesite, pyrochlore (?)	T 1404	14 00		1474	2877	1061	2269	72.5	35.4	5354	5948	663	41912
1400	69       	Sövite ≤ ankeritic cb Apatite, bastnaesite, pyrochlore (?)	T1405			4439	6633	1956	304.8	67.0	0.01	809	22086	305	14401
20-		Buft colored fing sölvs bergite carbon atized.		17 30						-					
2 (30) 2 (80) 2 (90)	1	IOcm tuffaceous grey rock Csg white sövite, feldspathic rock Manganiferous brown ankeritic cb	T14 06	2130	4.00	2065	4297	1390	273 .1	86.1	40.0	4603	20012	592	36120
	<b>⊗</b>	With apatite, bastnaesite	T1407	25 30	4.00	2565	5061	1641	256.0	59.1	8.6	1329	7839	284	11969
29 30 30 <del>30 20</del>	Ар : ::	Apatite rich		29 30		0100	4000	1700	2224	55.9	3.6	2591	1866	 334	16516
32.00		Carbonate mineral veinlet bearing	T 1408	32 00		2109	4209	1396	2224		3.6	2391	1000		10310
		Manganiferous ankeritic cb with apatite, bastnaesite (strontianite veinlet)	T 1409	3530	3.30	2985	4817	1262	183.6	37.3	17,1	. 832	3581	205	8445
			T 1410	38 70	3.40	2638	3656	834	123.4	24.7	3.1	1449	2445	109	4842
38.70 40 39.70	T T 45°	Pinkish brown limonitized trachitic dyke		39 70											
		Apatite bearing ankeritic cb.	T 1411		3.90	20623	23292	3442	461.0	50.1	⟨0,1	4360	55515	80	2462
4360 4420	limo x	Weathered Limonitized rock  Greyish green weathered nep syenite		43 60										, <del>, , , , , , , , , , , , , , , , , , </del>	
	X X	(biotite Ø lcm) (partly feldspathized)	. M												
50 <sub>50 20</sub> .							- 100 A	CONTRACTOR OF THE SECOND							

THE COOPERATIVE MINERAL EXPLORATION
IN
THE CHILWA ALKALINE AREA
REPUBLIC OF MALAWI
(PHASE II)

## GEOLOGIC DRILL LOG DDH JMT-14

Elevation 719.9 <sup>m</sup>
Total Depth 50.2 <sup>m</sup>
Inclination -90°

1:200

### LEGEND

<u>~</u> Drift
Sideritic carbonatite
Ankeritic Sövite
Sövite
Carbonate – Silicate rock
F:Feldspathic breccia, A: Agglomerate
\$\overline{x}_{\times} \overline{x}_{\times} \overline{\text{y}}\$     Syenite
$[x_{X}, x_{X}, x]$ Nepheline syenite
•

Dykes

T — Trachyte
P — Phonotite
S — Sölvsbergite
D — Dolerite
A — Aplite

Joint, Fissure

60 % of carbonatite content

Manganese oxide

HM Hematite

cal Calcite

	Co		<del>den sammed kan pag te day (day te da K</del> enterte)	···piùane em monera				Asso	ау	(	ppm	۱)	et fire Light Constant and Annie Cons	ne segent to some in	
Depth (m)	Geology E	Description	Sample No.	Depth	Thick- ness (m)	La	Се	Nd	Sm	Eu	Тb	Nb	Sr	Υ	Р
	1 ⊗ 1 A 1 ⊗ 1 H	Dark brown sideritic cb Matrix brown ankeritic cb (breecia feld rock, cb)	T 1501	3 10	3.10	3666	5385	1152	152.3	20.7	7.8	297	3075C	47	146
4.80 5.00	A F F G A	Carbonatized feldspaihic breccia  Reddish trachytic dyke Pinkish feld breccia with manganiferous cb patch (Ø 0.5 cm)	T 1502	6 30	3.20	833	1330	332	743	16.7	4.0	439	10494	114	7338
6.30 6.90 7.50		Feld. br. bearing sideritic cb with sövite vein Altered phonolite dyke (carbonatized) Ankeritic carbonatized agglomerate with white sövite vein	Т 1503		3.50	426	636	135	20.4	3.5	₹0.1	257	1993	45	3749
10 9 80	<b>1</b>	Carbonatized feld.rock Carbonatized feld.rock bearing sideritic cb (brown - dark brown)	T 1504	9.80	3.10	2205	3044	542	85.5	16.0	(O.1	997	6061	88	7333
13.20 14.70 14.80	A A A A A A A A	Gneiss breccia with clay Carbonatized agglomerate with sövite vein	T 1505	†2 90		1328	2228	460	755	14.0	25.3	251	11940	69	4279
18.50 20 19.50	A A A	Carbonatized fng agglomerate (brown to greenish grey) Apatite bastnaesite bearing dark brown		19 50				:			:				
21.20 21.80	Δ (40)	Reddish brown Apatite rock Carbonatized aggl. bearing ankeritic cb	T I 506		4.60	1251	1956	420	70.2	12.7	<b>(</b> 01	362	13393	79	3729
24.80 25 10	(i) A A A	Feldspathic rock and breccia Brecciated sideritic cb with white mineral druse (calcite) Slightly carbonatized agglomerate	T   507	24 10	4.20	956	1469	362	58.3	7.5	⟨0.1	538	5233	21	3521
30-		Feld rock bearing sideritic cb with sövite vein White rare earth mineral patch bearing agglomerate (with HCl —pale green cobr)	T 1508	28.30 30.60	2.30	2535	4099	1003	131.3	22.5	⟨0.1	312	2097	68	3256
	- (O.)	Feld br. sövite vein bearing dark brown sideritic cb with pyrite and calc silicate rock	T 1509	34.00		5711	8922	1972	290 9	43.3	(0.1	182	8965	72 ·	465
	F (0) A F A A A (45°	Carbonatized pink feldspathic breccia with sövite vein (w l cm )	T 1510		3.30	876	1208	345	47.2	10.2	0.9	249	6196	89	4543
37.30 37.60 3940		Sövite vein (csg) Feld br , sövite vein bearing light brown ankeritic cb Apatite , feld br , phonolite breccia ,	T 1511	37.30		3053	4508	965	138.5	212	1.5	244	8834	90	2836
		cb. breccia bearing dark brown manganiferous ankeritic cb	T 1512	41.40		2554	4256	1087	171.8	25.2	(0.1	436	10863	90	3476
46 IO 7	78	Feld, br. bearing light brown ankeritic cb Pale green phonolite dyke	T 1513	45 40	4.00	2253	3173	741	1289	23.9	(0.1	578	5274	122	6606
48 20 4940	<u>(</u> (())	Sövite vein with feld rock and ankeritic cb		4940											

THE COOPERATIVE MINERAL EXPLORATION
IN
THE CHILWA ALKALINE AREA
REPUBLIC OF MALAWI
(PHASE II)

## GEOLOGIC DRILL LOG DDH JMT-15

Elevation 783.5<sup>m</sup>
Total Depth 50.2<sup>m</sup>
Inclination -90°

1:200

### LEGEND

<u>~</u> ⊃ Drift	•
Sideritic	carbonatite
Ankeritic	Sövite
Sövite	
Carbona	te – Silicate rock
F:Feldsp	pathic breccia, A: Agglomerate
XXXX Syenite	
X x X x X Nephelin	ne syenite
Dykes	T — Trachyte P — Phonotite S — Sölvsbergite D — Dolerite A — Aplite
Joint, Fis	sure
60) % of ca	rbonatite content
Mn Manga	nese oxide
HM Hemat	ite

cal

Др

Calcite

Apatite

	log		and the second s			anggaphapa 3 that SM the SM	<del>a susannus upa sistenta</del>	Asso	зу	(	ppm	1)		***************************************	
Depth , (m)	Geology :	Description	Sample No.	Depth	Thick- ness (m)	La	Се	Nd	Sm	Eu	Тb	Nb	Sr	Υ	Р
1.00 2.10 2.50 3.00	(6)	Kaolinized,linonitized dark brown cb with feld, breccia Crashed Altered phonolite (brown)	Т 1601	1 0 0 3.00	2.00	1417	2092	506	98.9	21.0	<b>(</b> 0.1	550	13958	157	6345
3.20		Feld br. bearing carbonatite, agglomerate light brown colored \$0.5 - 2cm	T 1602	3.20	3.30	1828	2578	751	120.7	20.7	⟨0.1	571	5547	101	2190
6.50	0	Pink feld. rock phonorite breccia bearing dark brown sideritic cb. breccia size Ø 0.5 — 2 cm	T 1603	6 50	1	2410	3135	742	135.9	22.5	1.0>	503	1831	118	2665
IO 11.50 12.00	50°	Agglomerate (gneiss, feld. rock)	T 1604	9.50	4.30	2086	2815	702	121.0	20.5	⟨O.1	492	2427	108	2211
13.80 14.20	70 P P 30	Pale green altered phonolite with syenite xenolith.	-	13.80											
14.70 15.70 16.40 17.60	▲ (30) Å 1150) Å		T 1605		3.70	1693	2303	579	109.6	24.3 :	(0.1	380.	3126	175	6899
18.40 20 <u>19.90</u> 20.90	ı · /	Sövite, feld. rock, phonelite breccia bearing reddish brown carbonatized aggl.	T 1606	18.40	2.80	1812	2672	606	942	13.6	⟨0.1	445	28434	60	2173
21 20 22 70	(SO) (SO)	Light brown feld rock bearing cb.  Dark brown manganiferous sideritic cb	T 1607	21.20	3.30	3980	5856	1007	į81. I	26.1	<b>(</b> 0.1	241	41510	75	3058
25.00 25 <u>4</u> 0	(60) (60°	with Mn oxide White quartz, feld rock (calc silicate rock) pyrite bearing	T1608	24.50		4000	6062	1524	209 [	28.4	(0.1	318	22272	40	126
27.80 29.80 3000	A A A	Feld. rock , colc. silic rock , cb breccia bearing agglomerate (AO5-2cm) with (cal vein)		27.80				•							
30	A	Hematite, Mn oxide													
34.30	А Д А А	Mn oxide rich agglomerate													:
36.00 36.40	A A A	White calc silicate rock with Mn oxide carbonatized aggl.						· ·							
39.50 40	A A A A A	Light grey, brown agglomerate (feld.rock syenite cb) Ø0.5 — 2cm slightly carbonatized	T 1609	39.50	4.70	3190	4346	940	133.0	20.3	15.2	478	18657	79	1858
44.20 44.90	A A	Sideritic manganiferous cb with aggl.		44.20											
46.30 46.70 48.10	~ (60 √ ) PP ~ (50 √ )	Pale green mineral (monazite) bearing grey mineral and pyrite  Altered pale green	T 1610	48.10	3.90	4232	5424	1053	163.3	26.3	7.8	453	8411	83	1257
50 <sub>50 10</sub>	A A	Brown grey agglomerate (feld.rock.syenite dyke rock) hydrothermal altered pyrite sphalerite bearing	T1611	50.10	2.00	882	1244	341	63.3	12.5	(0.1	258	12392	106	6613
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No. of the

THE COOPERATIVE MINERAL EXPLORATION
IN
THE CHILWA ALKALINE AREA
REPUBLIC OF MALAWI
(PHASE II)

## GEOLOGIC DRILL LOG DDH JMT-16

Elevation 789.0<sup>m</sup>
Total Depth 50.1<sup>m</sup>
Inclination -90°

1:200

#### LEGEND

LEGEND
~~ Drift
Sideritic carbonatite
Ankeritic Sövite
Sövite
Carbonate – Silicate rock
F:Feldspathic breccia, A: Agglomerate
\$\overline{x} \overline{x} \overline{x}\$     \$\overline{x} \overline{x} \overline{x}\$
$(x_x, x_x, x_y)$ Nepheline syenite
Dykes  T — Trochyte P — Phonolite S — Sölvsbergite D — Dolerite A — Aplite
Joint, Fissure
60 % of carbonatite content
Mn Manganese oxide
HM Hematite
Calcita

	<del>aved thou</del> gh yet to	ľoi					менто и до продости на придости на при		Asso	19	(	ppm	1)		4.0.5.	
De	epth (m)	Geology Geology	Description	Sample No.	Depth	Thick- ness (m)	La	Се	Nd	Sm	Eu	Тb	Nb	Sr	Υ	Р
		A A A	Weathered kaolinized reddish brown mdg nepheline syenite rich aggl. Ankeritic cb Carbonatite agglomerate (syenite xenolith) Fng light brown sölvsbergite	Т 1701	2.90 5 20		1667	2258	665	170.1	50.8	35.5	447	2323	537	28908
10		\$ \$								,					**	
	15.00		Pink feld br bearing brown manganifenu ankeritic cb	T 1702	15 00		2154	3451	631	102.4	14.2	(0.1	716	1287	34	1049
	17 20 17. 70	() F	Feld br . Pink feld br. bearing dark brown sideritic cb	T 1703	17.70	3.00	4824	6110	1152	173.6	26.2	(O.I <sub>.</sub>	1332	20774	36	654
20	20.70	5)	Feld. br. bearing	T 1704	20.70		6424	8240	1420	219.8	30.9	7.2	717	35046	54	1636
	23.20		Apatite bearing (very few) dark brown manganiferous sideritic cb with feldspathic rock patch	T 1705	23 70	3.00	7514	9432	2191	335.5	54.6	14.3	1347	39107	56	338
	28.40 28.60 29.00	40 S S 45	Feld. br. Feld. rock xenolith bearing sölvsbergite	T 1706	29.00	2.30	10469	14429	2759	385.2	58.1	(0.1	2939	45170	50	1129
30	29.60	A A A (6) A (7)	Carbonatized. kaolinized aggl (pink)	т 1707	29.60	3.60	3040	5072	1098	184.7	289	1.9	1889	15696	46	768
	33.20 35.20		Apatite bearing sideritic cb  Altered white sölvsbergite	T 1708	33 20 -35.20	2.00	9936	13812	2946	399 5	62.8	30.3	3164	42502	38	159
	36.20	# F S A F	Apatite bearing carbonatized pink feld. br. with quartz patch	T 1709	36.20	3. 20	3720	5094	1061	180.7	27.9	(0.1	1940	15164	30	230
40	39.40		Apatite feld patch bearing sideritic	T 17 10	39 40		17513	21716	3353	502.3	69.1	4.2	2760	65149	54	149
		70		T 1711	42.90		14713	19349	3214	470.3	65.I	3.9	1828	58355	35	135
	48.60 49.00	<b>A</b> 30°	Apatite feldspathic br., quartz bearing light greytodark brown sideritic cb	T 1712	- 46 30 50.10	3.80	17476	21737	3398	497.6	68.0	0.3	1064	60992	35	200
50	50 10	777117			330											

THE COOPERATIVE MINERAL EXPLORATION
IN
THE CHILWA ALKALINE AREA
REPUBLIC OF MALAWI

## GEOLOGIC DRILL LOG DDH JMT-17

(PHASE II)

Elevation 768.0<sup>m</sup>
Total Depth 50.1<sup>m</sup>
Inclination -90°

1:200

## LEGEND

· ·
~~ Drift
Sideritic carbonatite
Ankeritic Sövite
Sövite
Carbonate - Silicate rock
F:Feldspathic breccia, A: Agglomerate
<sup>▼</sup> x <sup>X</sup> x <sup>X</sup> Syenite
x x x x Nepheline syenite
Dykes  T — Trachyte P — Phonolite S — Sölvsbergite D — Dolerite A — Aplite
Joint, Fissure
60 % of carbonatite content
Mn Manganese oxide
HM Hematite

cal Calcite

COLARIORATE	t hi <del>ndring part bles</del>	tion		And the state of t			- December 1		Asso	ЗУ	(	ppm	)			
(m)	Geology	Ë	Description	Sample No.	Depth	Thick- ness (m)	La	Се	Nd	Sm	Eu	Тb	Nb	Sr	Υ	Р
0.20	A 40 A		Carbonatized buff colored aggl	T 1801	0.20	3.10	1174	1814	507	108.0	25.2	18.8	210	16705	209	12096
8.30	A (A)		Carbonatized aggl. Phonolite, syenite, quartz, feld.rock bearing agglomerate.	T 1802	3.30		1074	1951	423	100.0	24.9	(0.1	229	10872	256	15024
7. 90 8.20 8.60	Λ & Δ A A A		Ocm Mn oxide bearing cb Ankeritic cb Silic-carbonatized agglomerate with pyrite	Т 18 03	7. 90		1618	2820	606	114 .1	23.5	⟨0.1	304	12170	202	11990
12.00 12.40	A A A		White silic. cb Pyrite bearing aggl. (hydrothermal altered)	T 1804	12 .00	3.10	1045	1561	457	106.4	27. 2	⟨0.1	258	6255	279	15631
15.10 15.00			Ankeritic cb Aggl bearing ankeritic cb	T1805	15.10	2.30	569	936	287	65.3	17.7	31.0	126	24135	202	12475
20-	A A		Grey to reddish brown colored feld br, cb, quartz rock bearing agglomerate ( Ø O 5cm— 3 cm ) hydrothermal altered, pyrite diss	Т 1806	20.40	3.00	643	1076	315	87.4	23.7	(0.1	163	15953	271	16180
	<b>Α</b>		nyaromermar anerea, pyrme aiss										·			
	<b>А</b> Д															
30	A .															
34.70	Α Α		Phonolitic rock breccia rich	·												
37.20	<b>A</b> A A <b>A</b>			-												
40	<b>А</b> А															
43.10 43.20 44.00	P P	60°	Barite Greyish green phonolite dyke		45.40								·			
	A A			T 1807	48 40	3.00		1422	372	76.7	13.1	⟨0.1	213	22404	84	4787
48.40 50 50 10			Strongly weathered manganiferous, limomitized cb apatite bearing	T 1808	50.10	1. 70	7900	9198	2838	436.3	,96.7	90.3	848	11623	810	46709
Charles of the state of the sta						 			uman en						± presidente di F	

THE COOPERATIVE MINERAL EXPLORATION

IN

THE CHILWA ALKALINE AREA

REPUBLIC OF MALAWI

(PHASE I)

## GEOLOGIC DRILL LOG DDH JMT-18

Elevation 774.7<sup>m</sup>
Total Depth 50.1<sup>m</sup>
Inclination -90°

1:200

### LEGEND

~ ~ Drift
Sideritic carbonatite
Ankeritic Sövite
Sövite
Carbonate – Silicate rock
F:Feldspathic breccia, A:Agglomerate
x x x X Syenite
$\begin{bmatrix} x & x & x \end{bmatrix}$ Nepheline syenite
Dykes  T — Trachyte P — Phonolite S — Sölvsbergite D — Dolerite A — Aplite
Joint, Fissure
60 % of carbonatite content
Mn Manganese oxide
HM Hematite
Calcite

Proportion and the second seco	ro		<u>темен жүрүү</u> дүй кімшін дүкіндерік (Осой) Өтө.	geggekiEktenkelk V\v≠	<del>e e e e e</del>	**************************************		4ssc	ıy	(	ppm	1)			
Depth Ge (m)	ology	Description	Sample No.	Depth (m)	Thick- ness (m)	La	Се	Nd	Sm	Eu	Тb	Nb	Sr	Υ	Р
1.30 1.80 3.30 4.80	Ap	Apatite sövite No core Apatite fragment (IOcm) Weathered limonitized nepheline	Т 1901	130	3.50	879	1630	581	140.9	47.1	49.5	82	4460	1510	122165
6.70 × 8.20 × 10 ×	× × ×	syenite (core 70cm) (core 80cm) Weathered kaolinized limonitized nepheline syenite													
14.60	A A A A A A A A A A A A A A A A A A A	Feld.rock,quartz bearing agglomerate  Limonitized apatite rock with barite  Reddish brown trachytic dyke  Barite bearing apatite rock	T 1902	12 40	2.20	708	1445	591	196.0	80.4	51.2	121	4457	1473	105549
1770 1820 1880 P 20 2040 F	i	Apatite rock xenolith bearing phonolite Apatite carbanatite with barite Barite bearing apatite carbanatite Apatite bearing cb	Т 1903	2090	3.20	429	812	264	62.3	18.0	31.5	110	2668	258	38815
2090 × ( 22.70	(A) ×	Barite bearing carbonatized nepheline syenite Apatite bearing cb Apatite cb bearing hydrothermal altered nepheline syenite	T 1904	2470	3.80	544	890	267	56.5	14.6	20.7	135	2195	242	35595
×	×	Weathered pinkish carbonatized nepheline syenite													
33 60 × 34.00 × 34.20	.Ap .	Apatite cb.	T 1905	33 60 34.30		363	672	235	60.2	21.3	31.1	236	2257	386	37938
3540 × 3560 ×		Carbonatized clay 20cm													
39.50 40 40 50	clay × × ×	Clay and sand Barite vein (w I—2 cm) and cb vein (w 3 cm) bearing weathered carbona— tized nepheline syenite										-			
4630	× × / 70°	Apatite cb  Carbonatite bearing weathered hydrotherma	T1906	46 30 47 10	3.00		270	76 35	21.9		32.9		2094		11734 5841
50 <sub>50.10</sub>	×	altered nepheline syenite		50 (0										- Alexandra - Alex	

THE COOPERATIVE MINERAL EXPLORATION

IN

THE CHILWA ALKALINE AREA

REPUBLIC OF MALAWI

(PHASE I)

# GEOLOGIC DRILL LOG DDH JMT-19

Elevation 738.9<sup>m</sup>
Total Depth 50.1<sup>m</sup>
Inclination -90°

1:200

### LEGEND

~~ Drift
Sideritic carbonatite
Ankeritic Sövite
Sövite
Carbonate - Silicate rock
F.Feldspathic breccia, A: Agglomerate
Sx   Sx     X   X     X   Syenite
x x x x X X X Nepheline syenite
Dykes  T — Trachyte P — Phonolite S — Sölvsbergite D — Dolerite A — Aplite
Joint, Fissure
60 % of carbonatite content
Mn Manganese oxide
HM Hematite
Cal Calcite

h Delignandransmussi amakii H	New York State of the State of	ion					<del>and the Control</del>		Asso	ју	(	ppm	۱)			
Depth (m)	Geology	Lineation	Description	Sample No.	Depth	Thick- ness (m)	La	Се	Nd	Sm	Eu	Тb	Nb	Sr	Υ	Р
1.60			Pink to dark brown apatite bearing sövite with feldspathic breccia	Т 2001	1.60		1580	2602	802	198.5	75.3	20.2	390	3250	743	61020
6.50 6.90	€0 P		Buff colored altered phonolite	T 2002	4·60 7.60	3.00	2131	3446	868	1667	40.9	<b>⟨</b> O.	386	11727	752	16918
10	€0		Apatite, sideritic cb bearing sövite partly feldspathic	Т 2003		300	1544	2410	567	83.6	17. 7	10.4	308	8847	133	7763
13.30				T 2004	13.30	2.70	1857	2834	711	99.7	16.7	(0.1	281	7746	91	4516
13.30	P		Buff colored altered phonolite													
16.80	€		Apatite, feldspathic rock, siderite bearing sövite	Т 2005	19.60	2.80	851	1353	354	37.8	1.01	6.2	140	12944	69	4371
20 19.60	Þ		Grey to buff colored phonolite		19.60											
22.40 22.60 24.20	P 60:															
25.00 26.20 28.40	P	20°	Reddish brown to white, pyrite bearing calc. silicate rock	Т 2006	2620	2.20	2832	4821	1388	2355	43.3	5.3	194	45964	141	6907
28.40 28.90 29.40 30	P clay		Brown clay		28.40 29.40											
33.50 33.80	× ×		Feldspathized	T2007	33.50 33.80		1936	3313	997	163.8	29.8	1.1	265	26008	135	7560
36.40	⊗		Apotite, feld. rock, siderite bearing sövite	Т2008	36.40	2.60	1555	2822	798	121.7	23.9	(0.1	235	3758	141	10265
39.30 39.90	A A		Kaolinized feldspathized altered agglomerate	Т 2009		4.50	869	1660	411	76.7	15.6	⟨0.1	274	4903	119	9087
40	A A			T 2010	39.90	3.20	1267	2206	631	105.3	21.6	11.8	291	10579	141	16005
43.10	~		Carbonatite bearing calc. silicate rock	T 2011	43.10		718	1287	320	64.0	12.0	(0.1	297	9981	87	8321
4780 48.30	× <u></u> 60			T 2012	46.60	3.60	925	1675	463	91.4	2 I. I	(01	247	4050	209	19832
50 <sub>50.20</sub>	· ·				50.20										parameter (1) of the second	and the same of th

THE COOPERATIVE MINERAL EXPLORATION
IN
THE CHILWA ALKALINE AREA
REPUBLIC OF MALAWI
(PHASE II)

## GEOLOGIC DRILL LOG DDH JMT-20

Elevation 708.0<sup>m</sup>
Total Depth 50.2<sup>m</sup>
Inclination -90°

1:200

#### LEGEND

LLOCIVD
Drift
Sideritic carbonatite
Ankeritic Sövite
Sövite
Carbonate - Silicate rock
F. Feldspathic breccia, A: Agglomerate
x x x X Syenite
x x x x X Nepheline syenite
Dykes
T — Trachyte ₽ —Phonolite
S—Sölvsbergite
D — Dolerite
A—Aplite
Joint, Fissure
60 % of carbonatite content

Manganese oxide

HM Hematite

cal Calcite

HELTONIAN CONTRACTOR AND	gazzan erren erretziak parten erretziak de de de	no		Assay (ppm)												
Depth (m)		Lineation	Description	Sample No.	Depth	Thick- ness (m)	La	Се	Nd	Sm	Eu	Tb	Nb	Sr	Υ	Р
(1117	Ар		Manganiferous cb patch bearing  Apatite carbonatite	T2101	0.00		1836	3197	975	192.6	54.2	9.8	461	7282	582	48055
4.10 6.00 6.40			Apatite and feldspathic rock bearing ankeritic cb  Trachyte aggl.	T 2102	4.10	4.50	371	694	200	38.6	6.0	12.4	283	1330	65	8232
8.60			Biotite rich dark green carbonatized		8.60					:						
10 10.00 12.10			rock Reddish brown ankeritic cb with little sövite	T2103	12.10	350	170	301	71	23.6	2.9	13.3	239	2675	44	8925
14.70			Dark greyish blue phonolite biotite phenocryst rich Ø0.5—1cm partly limonitized	T2104	14.70	1.60	274	445	8	30.2	6.1	13.1	263	1599	107	17847
16.30	нм ///60//		Limonitized cb bearing hematite mgt.  Apatite, feldspar patch pyroxere bearing ankeritic cb	T2104	1630	3.70	660		246	55.4	10.8	4.5	345	1615	88	9859
20 <u>2000</u> 21.70	S	40°	Pinkish grey pyrite, hematite bearing fng sölvsbergite		2000											
24.80		45	Pinkish brown apatite bearing ankeritic cb	T 2106	24.80	3.10	1270	1858	409	70.5	12.9	1.4	286	6452	100	7489
24.60	A A		Nepheline syenite, trachyte xenolith bearing carbonatized dark green phonolitic aggl.	T2107		4.40	252	452	145	28.4	4.5	(0.1	237	7755	. 50	3983
29 <i>2</i> 0 30 31.30	P	45"	Reddish brown altered mdg		29.20		·									
33.70 35.50 35.90			nepheline syenite  Ankeritic cb  Altered phoholite dyke (grey)	T 2 108	33.70		1456	2410	610	134.0	39.6	0.9		9956	430	24813
			Apatite bearing ankeritic cb with quartz calcite vein		3800			7670	11.05	2405	175 7	900	3 1930	4202	1147	61602
42.20	1 × ×		Dark green altered repheline syenite	T2109	4220		2121	3532	1195	342.0	155.5	03.0	1930	7202		
43.20 43.80 44.00 44.30 45.70	0// <b>/0/</b> // 0////////////////////////////		Greyish green phonolite dyke													
4630 4750	× ×   ⊗	1	Greyish green nepheline syenite  Ankerite bearing sövite, mag bearing	T 2 110	47.50	2.60	853	1504	420	94.7	26.5	10.0	396	20197	299	17155
50 <u>5010</u>					30.10											

THE COOPERATIVE MINERAL EXPLORATION IN

THE CHILWA ALKALINE AREA
REPUBLIC OF MALAWI
(PHASE II)

## GEOLOGIC DRILL LOG DDH JMT-21

Elevation 722.0 <sup>m</sup>
Total Depth 50.1 <sup>m</sup>
Inclination -90°

1:200

### LEGEND

∼~ Drift

Sideritic carbonatite

Ankeritic Sövite

Sövite

Carbonate – Silicate rock

F. Feldspathic breccia, A. Agglomerate

xxxx Syenite

 $\frac{x_{x} + x_{x}}{x}$  Nepheline syenite

Dykes

T — Trachyte P — Phonotite

S—Sölvsbergite

D — Dolerite A — Aplite

Joint, Fissure

60) % of carbonatite content

Manganese oxide

HM Hematite

cal Calcite

	0	A STATE OF THE STATE OF T	Assay (ppm)										de company and a second design		
] (m)	Geology E	Description	Sample No.	Depth	Thick- ness (m)	La	Се	Nd	Sm	Eu	Тb	Nb	Sr	Υ	P
2.00	Ap ~	(Float) core 20cm				a zalidoklonikowych Polobryk - C									***************************************
	4 A 4 4 4 A	Strongly weathered agglomerate and feldspathic breccia													
6.90 8.70	Min	Strongly weathered dark brown Mn oxide and limonite		8.70			·								
10	(6)	Apatite, bastnaesite bearing sideritic cb, black	T 22 01		4.80	10602	11920	1741	222.6	19.9	⟨0.1	198	26895	23	323
13.50 14.40		Dolomitic cb bearing (white)  Dark brown sideritic carbonatite	T 2202	13.50		5388	6114	873	124.7	10.0	0.2	108	39862	14	65
	(6)	(apatite patch) (feldspar patch) bastnaesite	T 2203	16.50	3.00	15984	17886	2442	333.0	31.4	1.0>	154	34195	40	146
20-			T 2204	19.50 22.00	2.50	18051	19865	2784	374.1	35.5	⟨0.1	191	20621	38	273
22.80 <del>.</del> 23.40	:: Ap: ; .	Drusy Drusy					<u> </u>								
24.50 25.10 26.30 26.50 27.10	Ap. /70°	Drusy Drusy fissure ( borite frogment )	T 2205	27.10	5.10	27002	32048	5395	712.9	83.6	2.1	1311	12659	125	4109
30	Ap	Apatite bearing dark brown sideritic cb and white sövite partly dolomitic	T 2206	30, 10		14053	15673	2252	332.6	37.3	1.0>	33.8	92802	64	2002
32.20 33.40	An II	Apatite cb (siderite, sövite)	Т 2207	33.40		4.4	13486	1820	241.4	21.8	17.4	178	49473	22	21
	Ар	Apatite bearing dolomitic cb	T 2208		3.50	11295	12676	1807	226.7	19.2	<b>⟨</b> O.I	78	45792	17	22
39.10	Ap 50°	Apatite sideritic cb (pinktodark brown 20cm sölvsbergite Crushed apatite sövite	T 22 0 9	36.90 40.40	3.50	3474	4930	1207	187.5	36.8	23.9	218	11720	245	13713
40.80	A p	Whitetodark brown apatite bearing cb  Apatite bearing dark brown cb  White cb.	T 2210			15205	17426	2547	324.0	30.3	7.9	2204	60227	34	627
44.80	× ×	Feldspar bearing white carbonate silicate rock with pyrite	T 2211	44.80	5.00	7045	8777	1217	257.3	38.4	4.1	826	33268	155	7515
1 1	× ×	Sideritic co							_			-3-			
50 <u>4980</u> 50.20	S.	Sölvsbergite		49.80											

THE COOPERATIVE MINERAL EXPLORATION

IN

THE CHILWA ALKALINE AREA

REPUBLIC OF MALAWI

(PHASE II)

## GEOLOGIC DRILL LOG DDH JMT-22

Elevation 739.0 m

Total Depth 50.2 m

Inclination -90°

1:200

### LEGEND

<u>~</u> Drift
Sideritic carbonatite
Ankeritic Sövite
Sövite
Carbonate - Silicate rock
F:Feldspathic breccia, A: Agglomerate
F <sub>X</sub> X X Syenite
[X X X X X] Nepheline syenite
Dykes  T — Trachyte P — Phonolite S — Sölvsbergite D — Dolerite A — Aplite
Joint, Fissure
60 % of carbonatite content

Manganese oxide

HM Hematite

cal Calcite

right-month development				ademica de la companya de la company			*	Ass	ay	(	ppn	ገ)	Фейоналия на под общения и		
Depth (m)	Geology	Description	Sample No.	Depth (m)	Thick ness (m)	La	Се	Nd	Sm	Eu	ТЬ	Nb	Sr	Υ	Р
2.30 3.00 3.50 4.30	^^ ^ A	Silicified reddish brown aggl. Aggl. bearing siderific cb. Reddish brown altered phonolite Reddish brown trachyte breccia bearing carbonatite, partly silicified and kaolinized	T 230I	4.30	4.00	979	1482	370	70.5	14.7	(0.1	292	1971	149	13408
8.30 IO	60	Feld. breccia bearing apatite cb	T 2302	8.30	3.00			318	74.2	8.9	9.5	315	1197	62	3357
	50	Reddish brown feldspathized cb Sideritic cb	T 2303	14.30	3.00	657	981	218	19.6	5.4	₹0.1	173	5821	38	1437
	(50) (50) (60) (60)		T 2304		4.30	1945	2876	600	81.8	13.5	(0.1	318	4195	67	1424
20 = 2120	60	Sovite bearing ankeritic cb  Sovite bering ankeritic cb	T 2305	1860	4.30	505	805	180	35.3	6.9	(0.1	297	1729	66	7094
22.90 23.90	P 50	Reddish brown carbonatized altered  Aggl. bearing cb	T 23 06	2290 2390		455	738	191	33.9	7.9	⟨0.1	306	2184	64	6213
	▲ A A A A A A A A A A A A A A A A A A A	Carbonatized aggl		2620							_				
28.60 30	50	Carbonatized aggl matrix ankeritic cb.	Т 2307	28.60	4.40	813	1248	265	55.7	98	10.9	319	1860	120	9426
3440 3600		Original rock nepheline syenite	Т 23 08	3300		2108	3097	648	108.8	16.0	⟨О.1	345	5046	58	1893
70.70	P	Carbonatized feld rock Greenish grey pyrite bearing altered		37.40							. :				
40 <sup>39.70</sup> 40.60 41.90	60     89 	Breccia bearing manganiferous ankeritic of Dolomitic cb and ankeritic cb  Dark brown manganiferous ankeritic cb (44.1m baryte crystal)	т 2309		5.00	5992	8524	1750	254.6	34.7	1.0	410	22377	103	2630
	A A A A A A A A A	Carbonatized agglomerate reddish pink color	T 2310	44.70	5.50	814	1247	267	45.0	7.1	(0.1	385	31941	72	3048
50 <u>4970</u> 50 <u>5020</u>	A 400AA	Ankeritic cb bearing carbonatized aggl.  Carbonatized feld aggl.		5020											

THE COOPERATIVE MINERAL EXPLORATION

IN

THE CHILWA ALKALINE AREA

REPUBLIC OF MALAWI

(PHASE I)

## GEOLOGIC DRILL LOG DDH JMT-23

Elevation 7940<sup>m</sup>
Total Depth 50.2<sup>m</sup>
Inclination -90°

1:200

### LEGEND

<u>~</u> Drift
Sideritic carbonatite
Ankeritic Sövite
Sövite
Carbonate – Silicate rock
F:Feldspathic breccia, A:Agglomerate
\$\overline{\nabla_x \nabla_x \nabla}\$   \$\overline{\nabla_x}\$
$(x_x, x_y, x_y)$ Nepheline syenite

Dykes

T — Trachyte
P — Phonolite
S — Sölvsbergite
D — Dolerite

A-Aplite

Joint, Fissure

% of carbonatite content

Manganese oxide

HM Hematite

ca Calcite

		rtion			<del>POSSONO POR PORTO</del>			सम्बद्धाः स्टब्स्य विशेषात्र्यस्य उद्य	Ass	ay		(ppn	<b>n</b> )	in programme and the second	PARAMETER AND STREET	KEROCEKA ETA-MALISTAR
Depth (m		اً ا	Description	Sample No	Depth (m)	Thick ness (m)	La	Се	Nd	Sm	Eu	Tb	Nb	Sr	Υ	P
1 00	<u>~</u> ~ . Ap		Pale pinkish grey apatite sovite	T 2401	1.00	1.90	3834	5318	1361	274.7	71.9	13.7	935	4189	977	78547
4.90	6	45°	Apatite, bastnaesite bearing cb with magnetite greyish green nepheline syenite	T 2402	2 90	2.00	3833	5139	1204	204.2	48.5	31.7	567	7564		45655
6 30 8 20	× × ×		Carbonatized nepheline syenite barite bearing biotite rich	T 2403	6.30		196	325	54	23.2	2.7	168.1	272	1941	38	6436
10	Ар		Limonitized apatite rock  (drusy core 1.6 <sup>m</sup> )	T2404	820	4.70	4860	6891	1384	258.4	54.0	(0.1	1834	3372	640	43271
12.90	(⊗		Brown sövite		12 90					200.				3372	040	45271
15.90			Roddish hamma	T2405	15.90	3.00	264	426	104	13.3	3.8	(0.1	261	5364	53	4478
	* A		Reddish brown carbonatized aggl.	T 2406	18.90	3.00	297	491	117	26.9	4.0	₹0.1	222	7331	. 42	3708
20- 20 60 20.80			Carbonatized	T2407		3.00	784	1157	295	47.7	8.0	(0.1	301	5096	39	2775
24.90	A _			T 2408	21 90	3.00	276	458	127	23.5	38	28.9	254	3301	26	1626
25.60 - 27.60 -	Δ A Δ A	-	Weakly carbonatized agglomerate reddish browntogreenish grey		24.90											
30	Α		trachyte fragment ø 3cm Carbonatized agglomerate (core crushed)	T 2409	2760	4.80	578	949	294	51.1	13.1	<b>(0.1</b>	307	2387	135	12720
	• A				3240											
	•			T 2410		4.80	914	1355	408	81.1	15.4	95.7	357	8645	156	14473
	A		Calc. silicate rock  (original rock is nepheline syenite)		3720											
39.40 40 40.7	<del>+</del> - <del> </del>		Fng dark green nepheline syenite  Carbonatized nepheline syenite													
	+		(dark green to grey) partly brecciated	erin	,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,											
	+ .															
50	+							:								
50.10																

THE COOPERATIVE MINERAL EXPLORATION
IN
THE CHILWA ALKALINE AREA
REPUBLIC OF MALAWI
(PHASE I)

## GEOLOGIC DRILL LOG DDH JMT-24

Elevation 754.4<sup>m</sup>
Total Depth 50.1<sup>m</sup>
Inclination -90°

1:200

### LEGEND

Drift

Sideritic carbonatite

Ankeritic Sövite

Sövite

Carbonate - Silicate rock

F:Feldspathic breccia, A: Agglomerate

X X X X

Nepheline syenite

Dykes

T — Trachyte P — Phonotite

S—Sölvsbergite

D — Dolerite A — Aplite

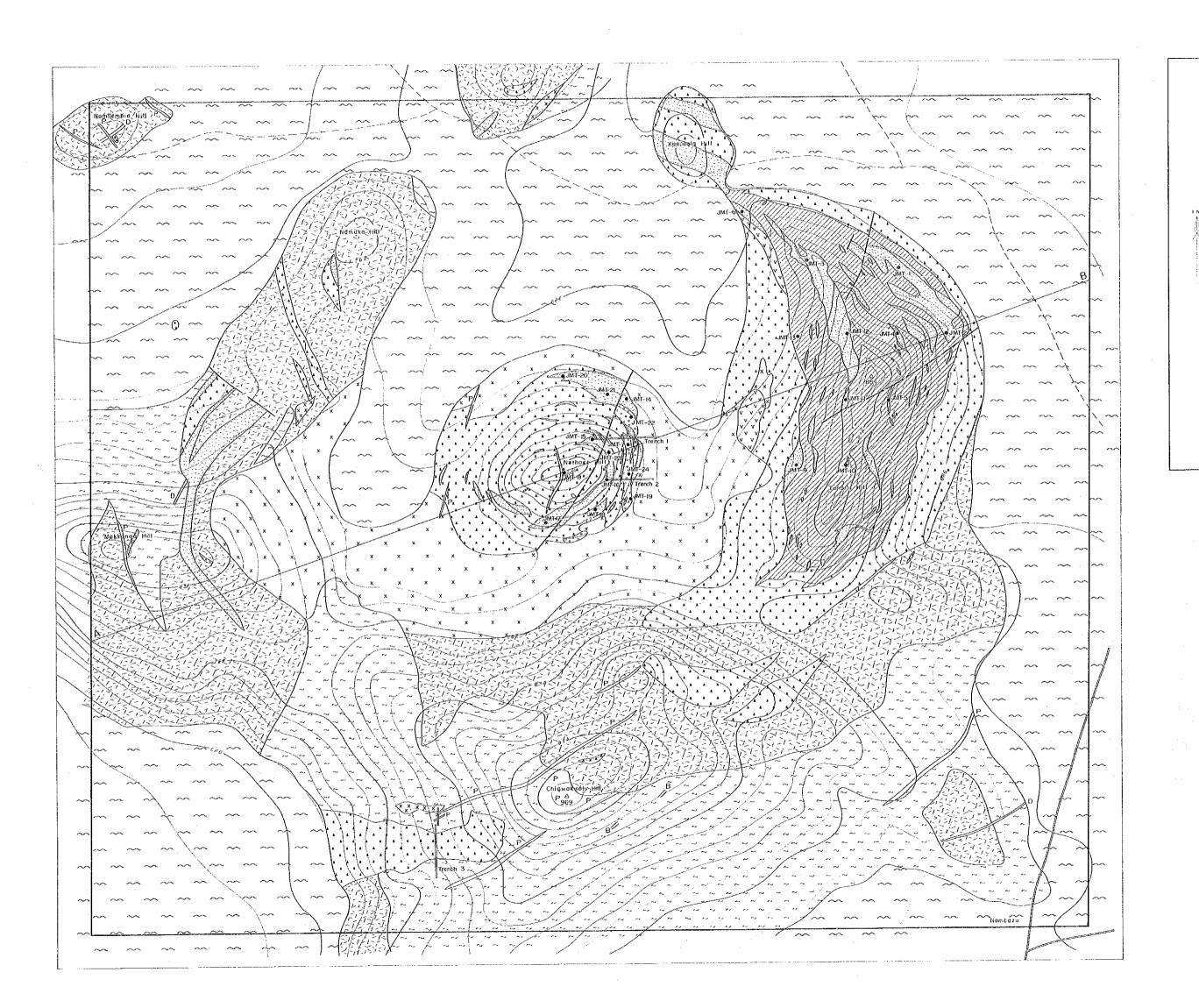
Joint, Fissure

% of carbonatite content

Manganese oxide

HM Hematite

cal Calcite



COOPERATIVE MINERAL EXPLORATION

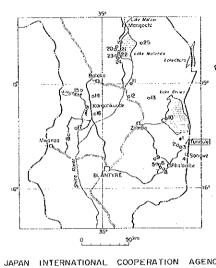
THE CHILWA ALKALINE AREA

REPUBLIC OF MALAWI

(PHASE II)

GEOLOGICAL MAP AND PROFI

OF TUNDULU SECTOR



METAL MINING AGENCY OF JAPAN FEBRUARY 1988

250 m

#### LEGEND

Scale 1 : 5,000

Drift

Carbonatite

Carbonatite

Apotite rock

Carbonatite bearing agglomerate / felds

Agglomerate / feldspathic rock

V V V V

Dyke / ptug P phonolite

S solvsbergite

T trachyte

J juvite

X X X Nepheline syenite

Gneiss

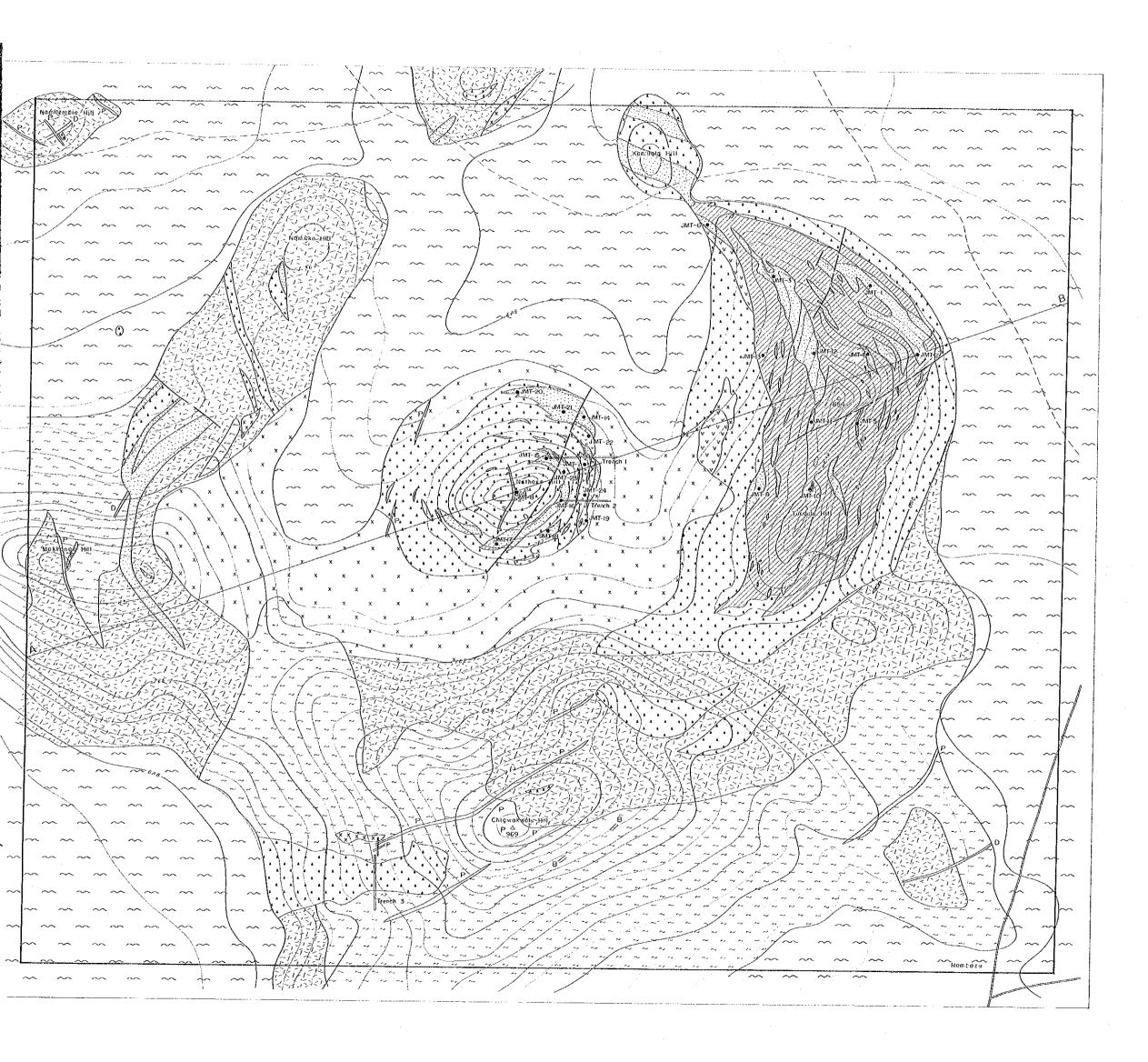
Syenite

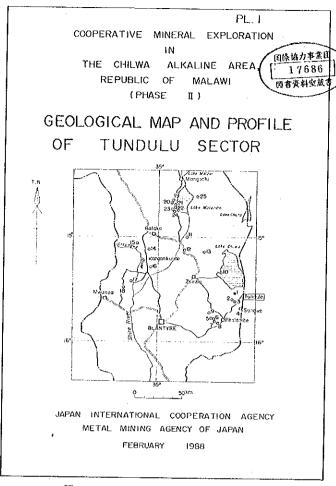
Fault

Drilling site (1987)

Trench (1987)

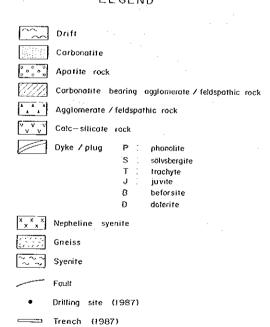
A B Profile line



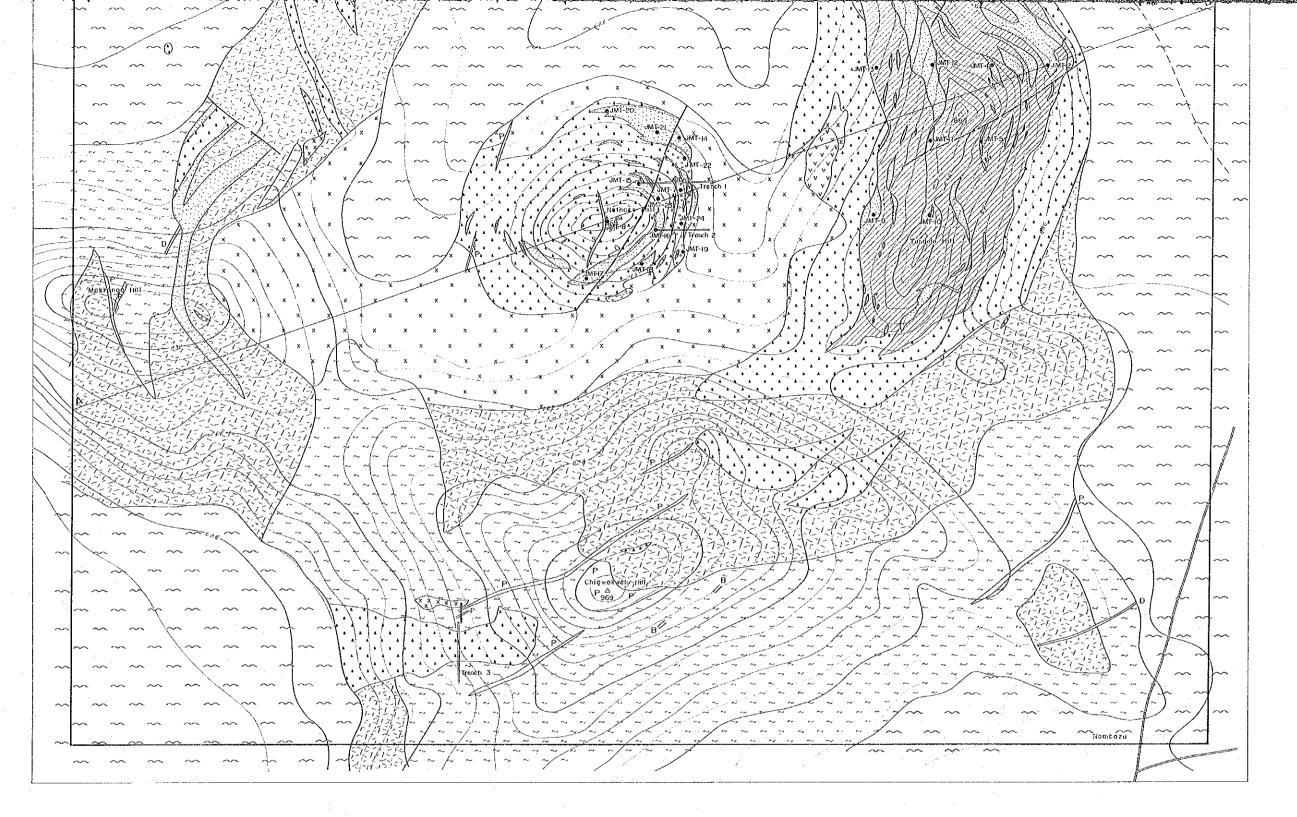


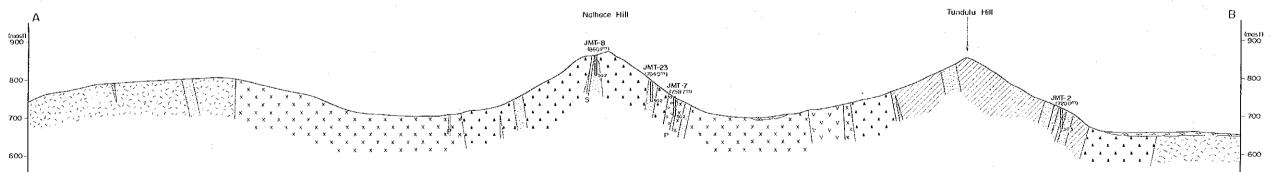
#### LEGEND

Scale | 1 : 5,000



A B Profile line





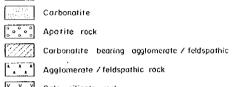


JAPAN INTERNATIONAL COOPERATION AGENCY METAL MINING AGENCY OF JAPAN FEBRUARY 1988

Scale | 1 : 5,000

LEGEND





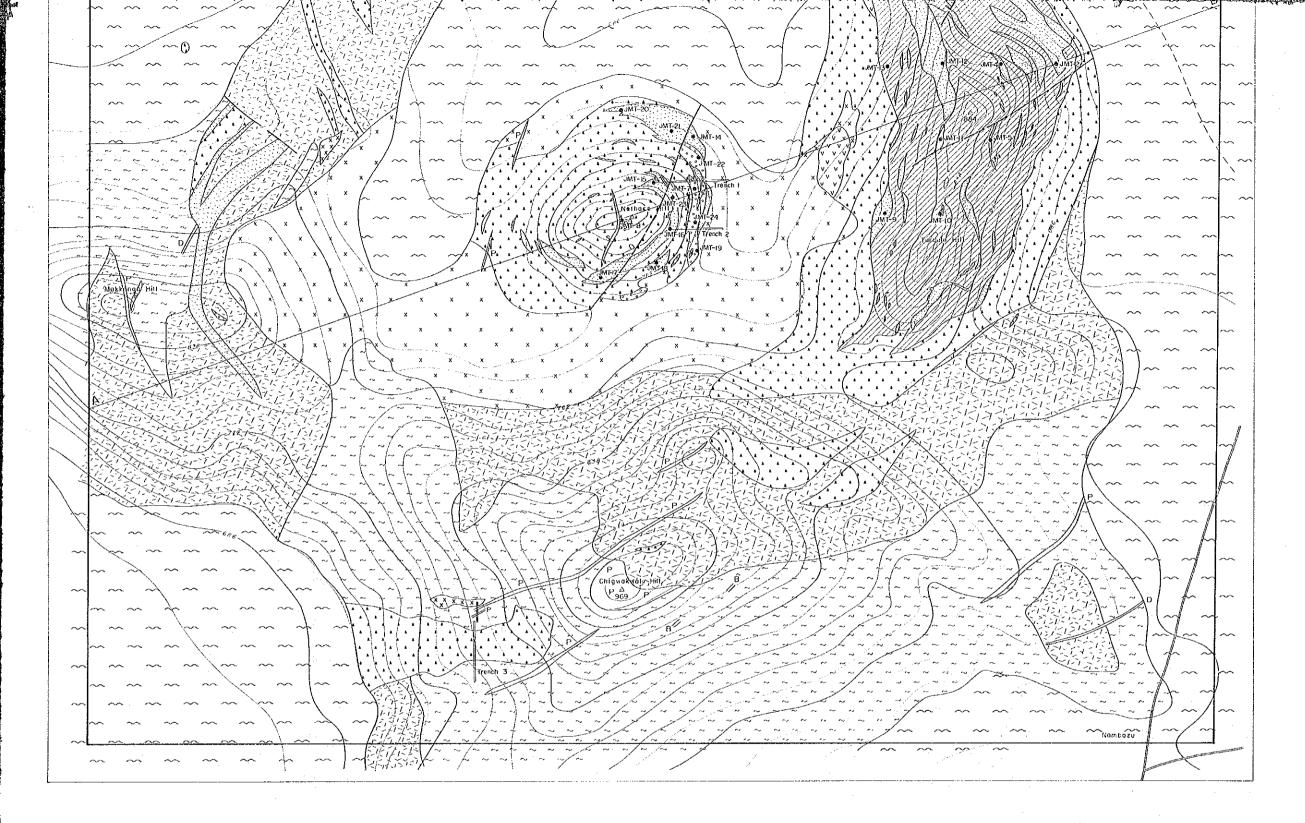
V V V Calc-silicate rock

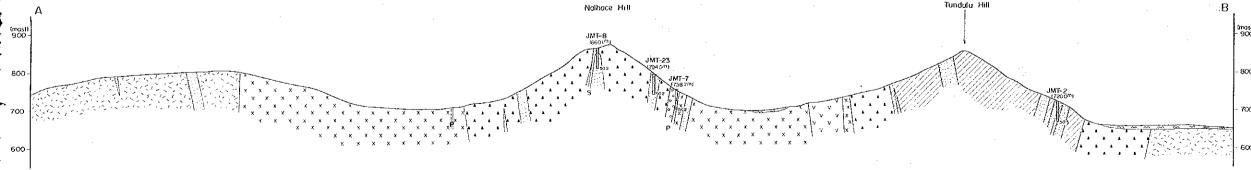
Dyke / plug

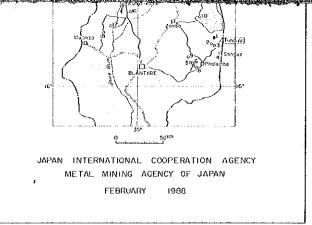
x x x Nepheline syenite

Gneiss

A B Profile line

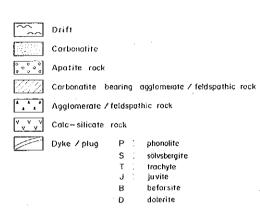






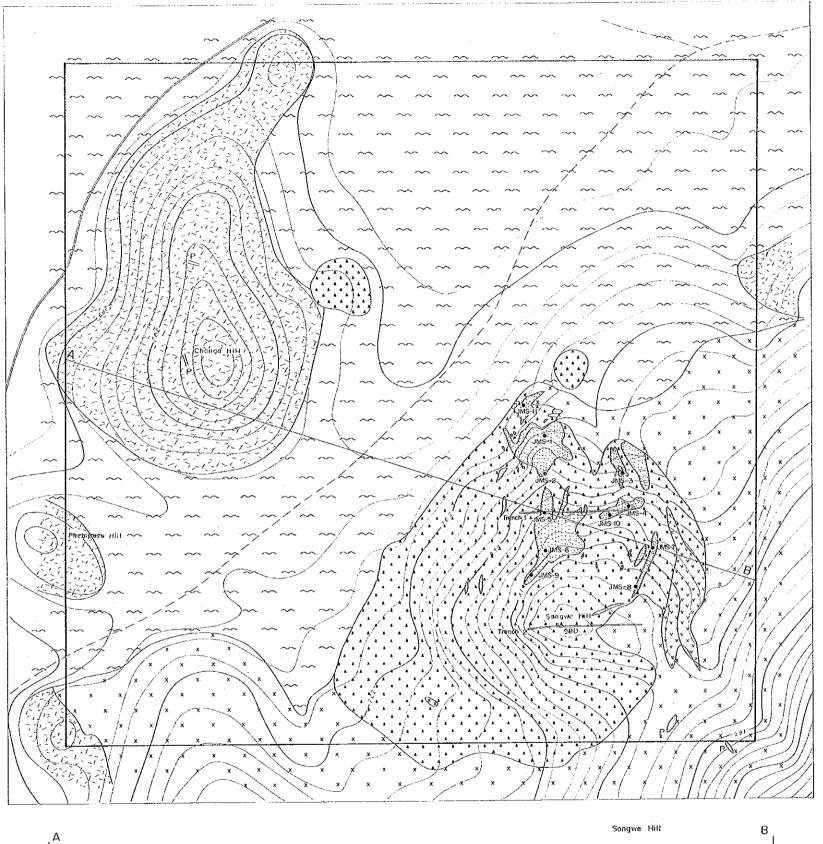
Scale 1:5,000

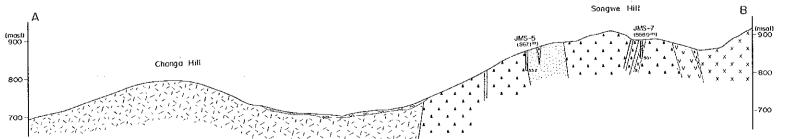
#### LEGEND

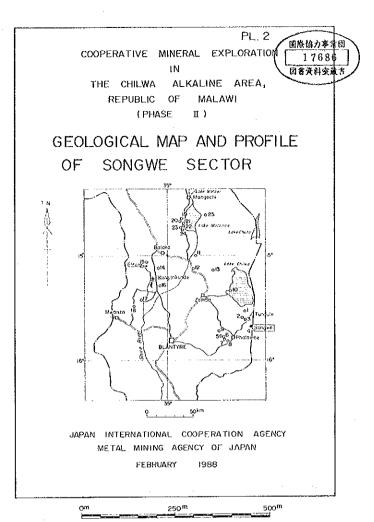


x x x Nepheline syenite

Gneiss







LEGEND

Drift

Carbonatite

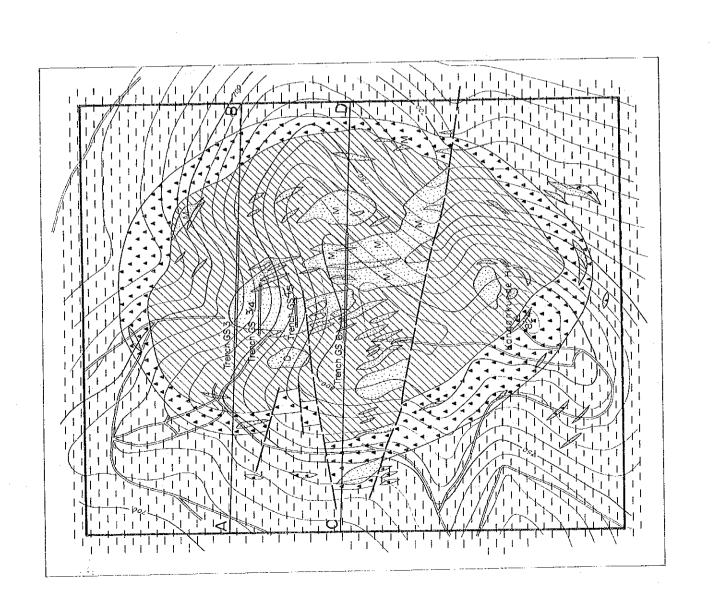
 $\begin{bmatrix} \frac{k-k-k}{k-k} \end{bmatrix}$  Agglomerate / feldspathic rock

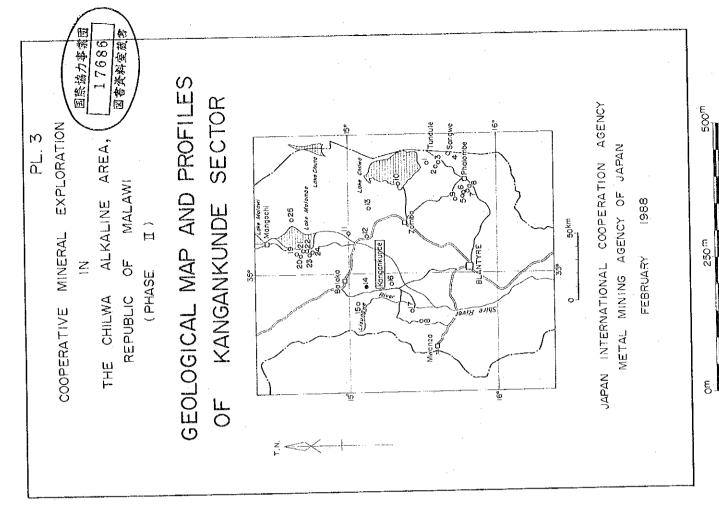
Scale 1:5,000

V V V Calc - silicate rock

Gneiss

4 8 Profile line

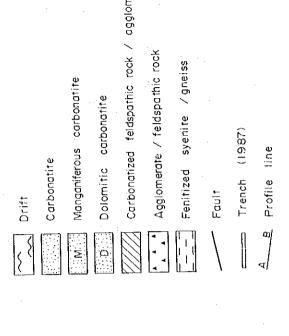




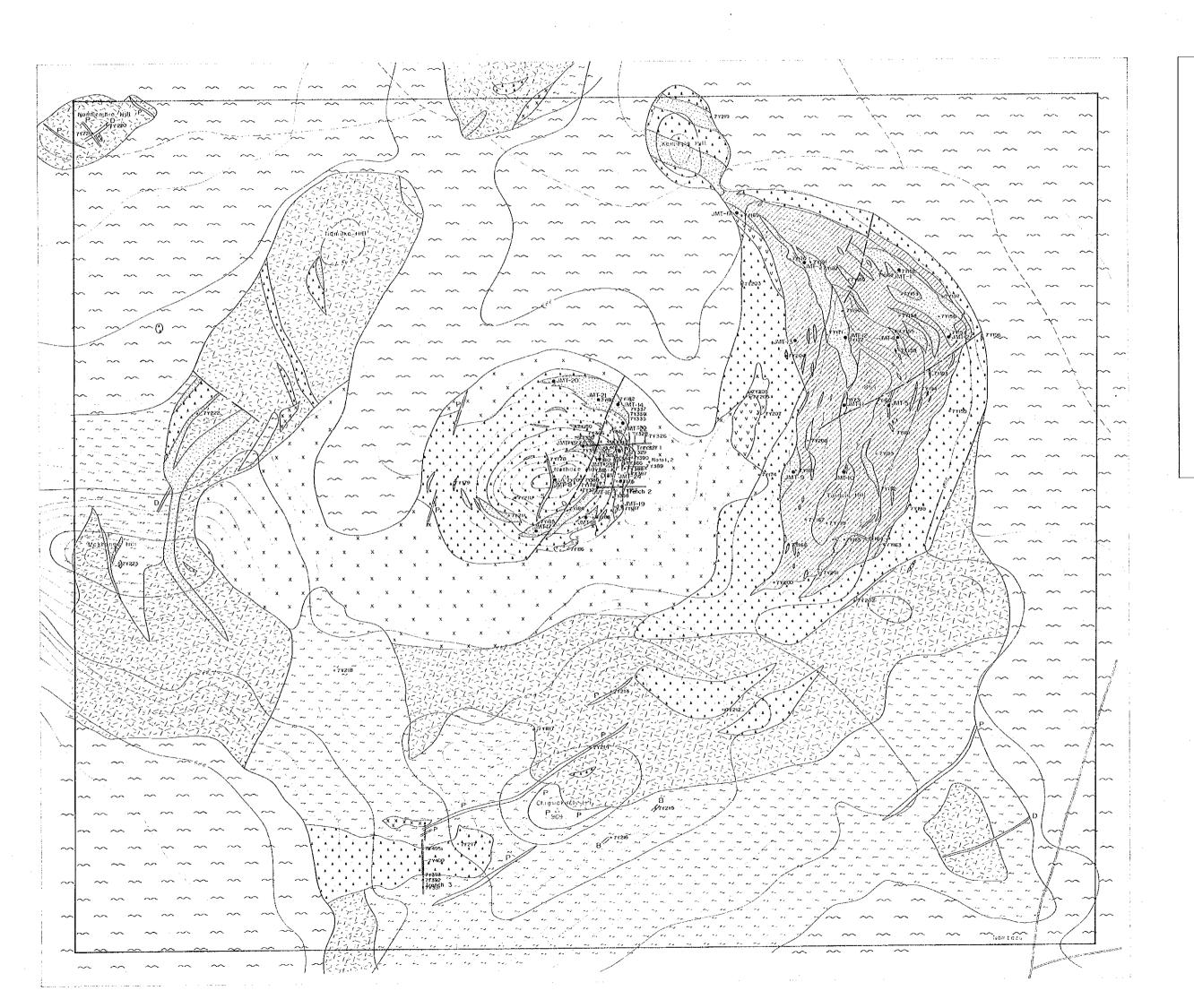


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Scale



(mast) 800 -



COOPERATIVE MINERAL EXPLORATION
IN
THE CHILWA ALKALINE AREA,
REPUBLIC OF MALAWI
(PHASE II)
LOCATION MAP OF GEOCHEMICAL
SAMPLES AND ROCK SAMPLES
OF TUNDULU SECTOR

JAPAN INTERNATIONAL COOPERATION AGENCY METAL MINING AGENCY OF JAPAN FEBRUARY 1988

om 250 m Scale 1:5,000

#### LEGEND

Drift

Carbonatite

Apatite rock

Carbonatite bearing agglomerate / feldspathic rock

Adglomerate / feldspathic rock

Calc-silicate rock

Dyke / plug P phonolite
S solvsbergite
T trackyte
J juvite
B beforsite
D dolerite

X X X Nepheline syenite

Gneiss
Syenite

Syenit

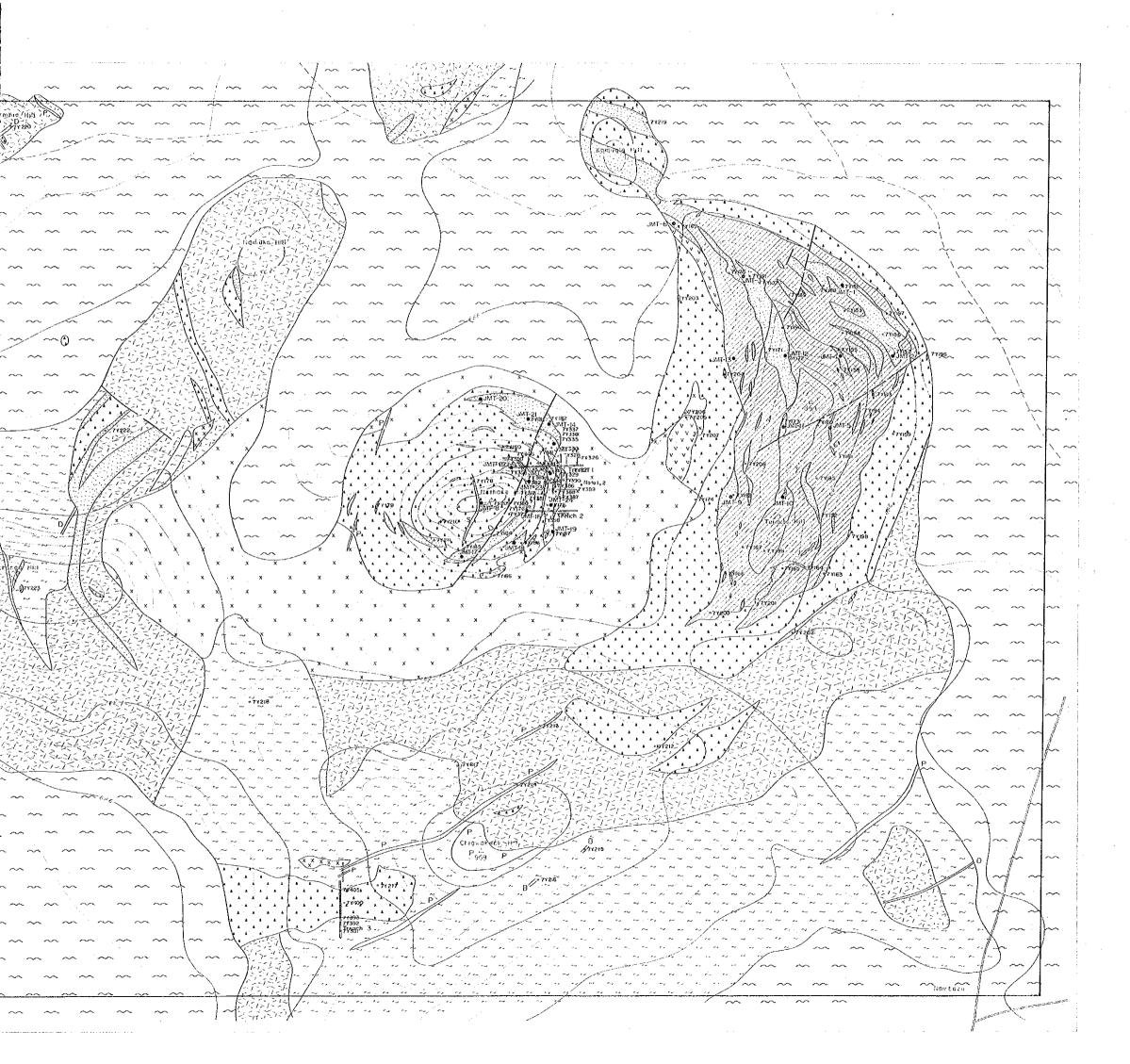
Fault

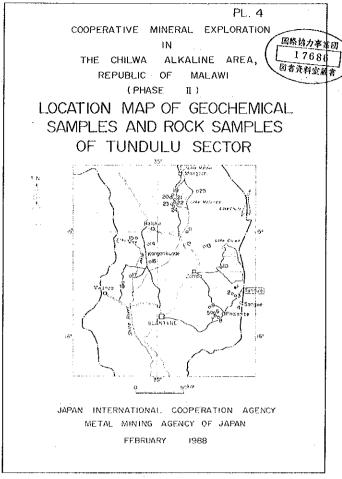
• Drilling site (198

A B Profile line

o 77001 Geochemical sample

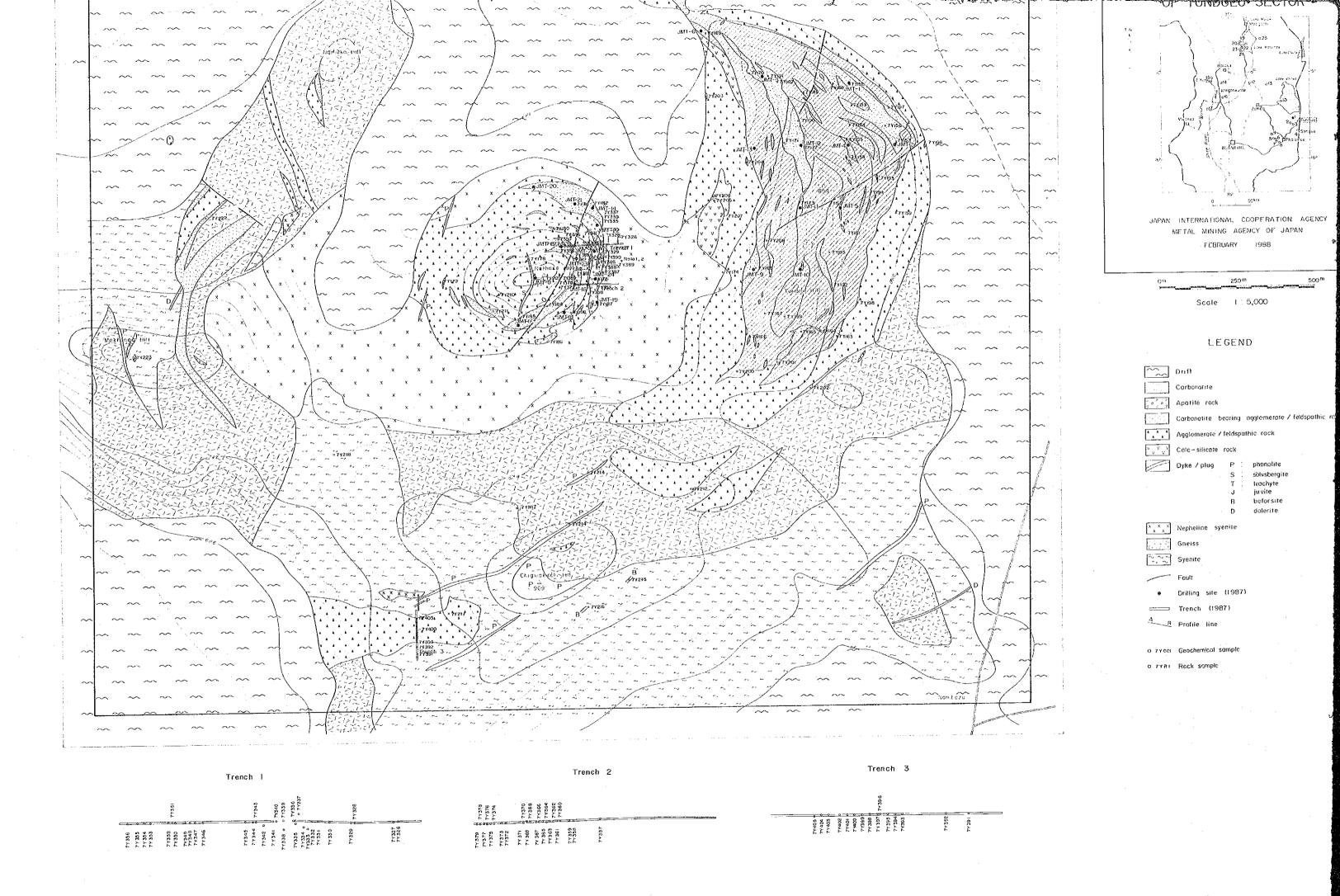
o 7181 Rock sample

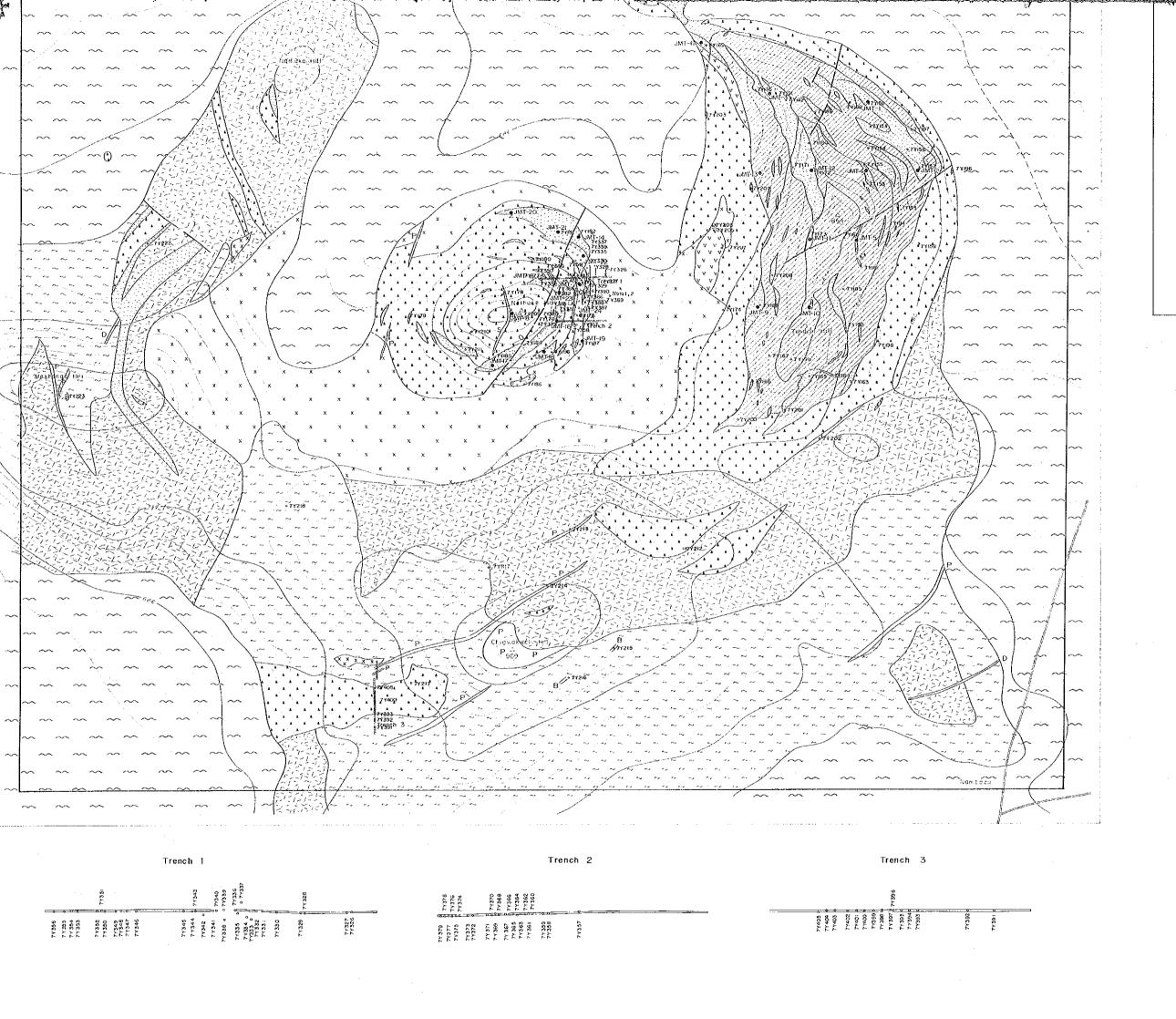


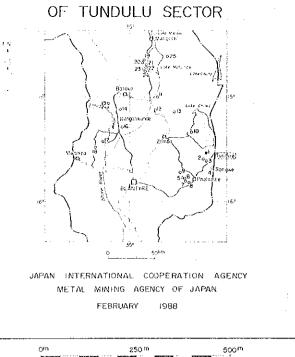


Scale | 1 : 5,000

LEGEND Drift . Corbonatite. Apatite rock Carbonatite bearing agglomerate / feldspathic rock Agglomerate / feldspathic rock V V V Calc-silicate rock Dyke / plug P solvsbergite juvité beforsite  $\begin{bmatrix} x & x & x \\ x & x \end{bmatrix}$  Nopheline syenite Gneiss Syenite • Drilling site (1987) Trench (1987) A Profile line o 71001 Geochemical sample o 7181 Rock sample



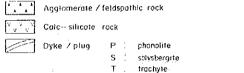


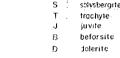


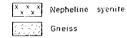
LEGEND

Scale | 1 : 5,000

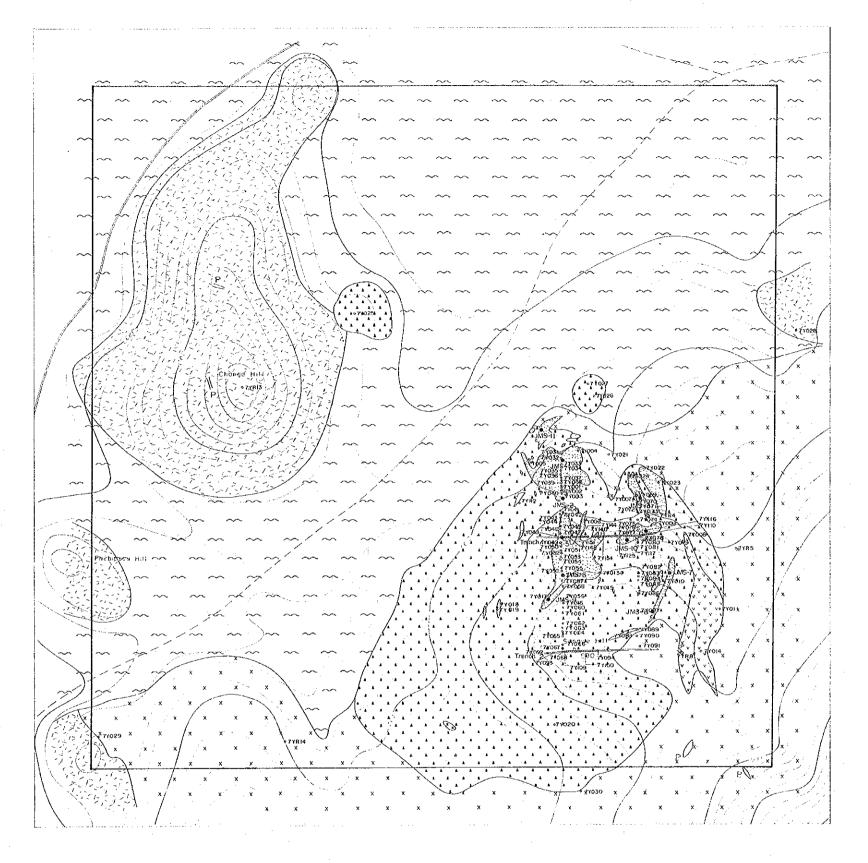








o 7181 Rock sample

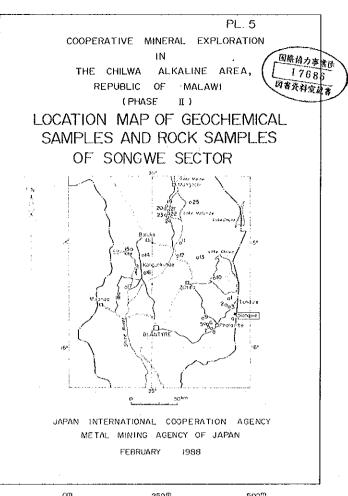


Trench 1



Trench 2

77099 77105



\*\* 250\*\* 50 Scale 1 : 5,000

#### LEGEND

Drift

Carbonatite

Agglomerate / feldspathic rock

V V V V V Calc - silicate rock

PDyke P phonolite

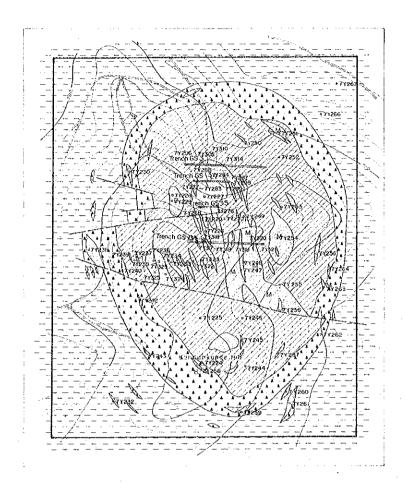
X X V Nepheline syenite

Gneiss

Drilling site (1987)

o 7Y001 Geochemical sample
o 7Y81 Rock sample

8 Profile line



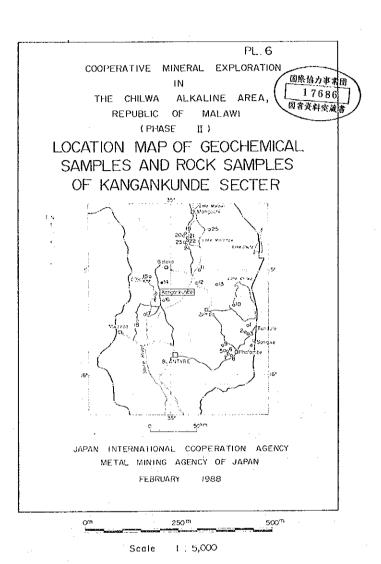
Trench GS 3

Trench GS 3/4

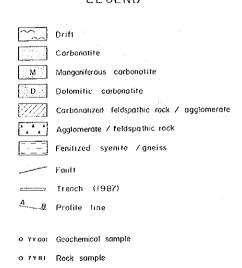
Trench GS 4/5

Trench GS 6

77515 • 777316 • 777319 • 777319 • 777350



#### LEGEND



WAY THE CONTRACT

