GEOLOGY AND GEOCHEMISTRY OF THE

XM, XN, BY, GRAN, XW, XJ, XK, XL, MINERAL CLAIMS

Record Nos. 407 - 414

Liard Mining Division

N.T.S. Designation 94K 4W (GRAN , BY)
58°09'N, 125°57'W

N.T.S. Designation 94LIE (XM, XN, XW, SJ, XK, XL)
58°13'N, 126°07'W

Owner of Claims and Operator : Granby Mining Corporation

Date Submitted March 1978

Author : J.H.B. Wilkins, B.Sc., D.I.C.
Supervisor : D. H. James, P. Eng.

Granby Mining Corporation

April 18, 1978

Department of Mines
and Petroleum Resources
Victoria, B.C.

Dear Sirs,

The accompanying report on the Gran and By and the X claims was prepared by Mr. J.H.B. Wilkins whose qualifications are listed in the report. Mr. Wilkins' experience included 8 years of exploration in Yukon Territory and northern B.C., involving the concept, planning, supervision and reporting of projects. I consider him fully qualified. He carried out the program as senior geologist in the employ of Granby under my supervision as manager of exploration.

Yours very truly,

D. H. James M.Sc. P. Eng.
Manager Exploration

DHJ/tv
Encl.

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1. INTRODUCTION

Eight claims totalling 126 units were staked by Granby Mining Corporation arising from a regional reconnaissance programme in the Gataga River area in June 1977. These are in two blocks. The one, the GRAN and BY claims (20 and 10 units respectively), lies in NTS square 94K4W several kilometres due west of Mayfield Lakes, and the other, the X series claims (XJ-20 units, XK-20, XL-18, XM-10, XN-10 and XW-18), lies in NTS square 94L1E some 25 km west of the Lakes in the Braid Creek - Through Creek area. Fig 1 shows the location of these claims and Table 1 summarizes their registration data.

Table 1 Granby Gataga Claims Data Summary

Claim Name	Record No.	Tag No.	No.of Units	Date Staked	Date Recorded	Anniversary Date	NTS
XM	407	35293	10	25 June/77	29 June/77	29 June/78	94L1E
XN	408	35294	10	26 June/77	29 June/77	29 June/78	94L1E
BY	409	35288	10	7-9 June/77	29 June/77	29 June/78	94K4W
GRAN	410	35287	20	7 June/77	29 June/77	29 June/78	94L1E
XW	411	35290	18	20 June/77	29 June/77	29 June/78	94L1E
XJ	412	25391	20	20-24 June/77	29 June/77	29 June/78	94L1E
XK	413	35292	20	23-24 June/77	29 June/77	29 June/78	94L1E
XL	414	35289	18	14-16 June/77	29 June/77	29 June/78	94L1E

Mineralizations found are mostly smithsonite with some sphalerite in the X series claims, and vice versa in the GRAN and BY claims. The former are in a baritic shale and clastic environment and the latter lie close to a limestone-shale contact.

It is most important indeed to note that the work done and results obtained to date are of an introductory nature as opposed to an exhaustive and detailed study.

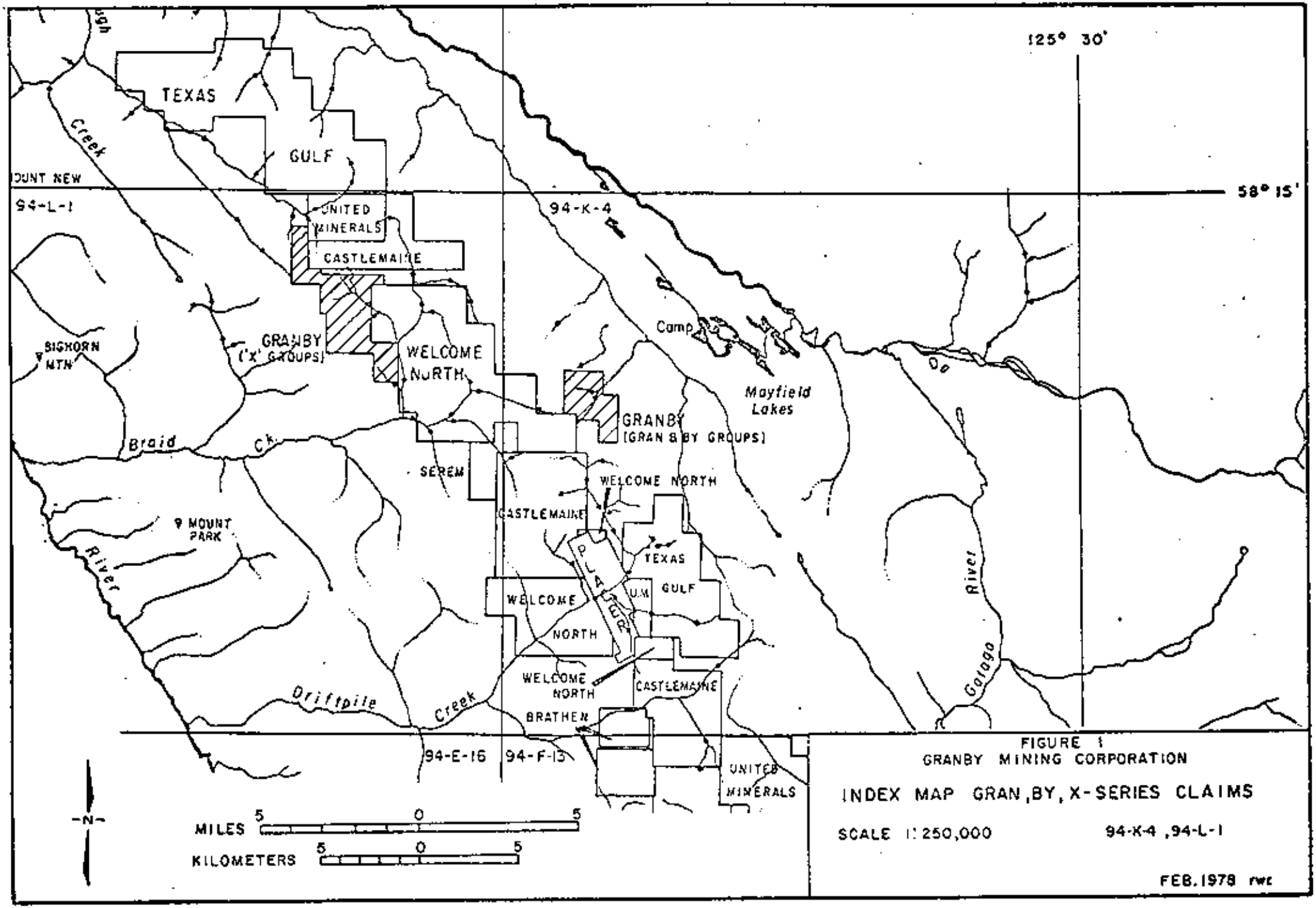


FIGURE 1
GRANBY MINING CORPORATION
INDEX MAP GRAN, BY, X-SERIES CLAIMS
SCALE 1:250,000 94-K-4, 94-L-1
FEB. 1978 rwc

2. LOCATION ACCESS AND LOGISTICS

Gataga lies some 65 km north of Waze, 225 km west of Ft Nelson and 270 km south of Watson Lake. Gataga River is a tributary of Kechika River which flows north along the Rocky Mountain Trench to join the Liard southeast of Watson Lake. The low lying Trench and Gataga valley provide an almost all-weather flight path from Watson Lake to the area, and weekly fixed wing flights were consequently arranged with B C and Yukon Air Services for camp expedition. We camped on Mayfield Lakes. Aviation fuel was trucked from Ft Nelson to Muncho Lake 90 km east of Mayfield, and flown in by a single engined Otter; the 1500 m pass immediately east of Mayfield was usually clear enough for this when required. Camp mobilization and demobilization were by the same route.

We employed a Bell B2 helicopter on contract from Northern Mountain Helicopters in Prince George for local transport.

We flew into camp on May 26 and left on July 9. Granby's crew comprised six geologists and prospectors, a cook and the pilot. It was an especially active area with Texas Gulf, Welcome North, Serem and Cyprus Anvil besides ourselves conducting reconnaissances, and over 2000 claims were staked in Gataga altogether. Canex Placer have held a property astride Driftpile Creek since 1974 (assessment report #5359).

It is, in summary, a remote and costly exploration area.

3. TOPOGRAPHY

Viewed from high altitude, the area shows the deployment of closely spaced, steeply ridged mountains separated by sharp V-shaped valleys, all aligned parallel to the cordilleran trend in a NNW-SSE direction. The eastern

flank of the area of interest (where the GRAN and BY are staked) consists of massive white limestone which rises abruptly from the wide and flat Gataga valley and reaches peaks over 2400 m high. West of this various shales form more recessive topography and west again a resistant clastic section (where the X series are staked) forms elevations of about 2000 m. These rock units are described and discussed below. Drainages are mostly trellised by the regional geological fabric.

Vegetation is customarily sparser at higher elevations and thicker at lower, and valley floors are only moderately boggy.

4. WORK PERFORMED

Work on the claims included geological mapping and prospecting, silt sampling, soil sampling, rock chip sampling, pebble carding, together with laboratory assaying and petrography. An analysis of the costs involved is given in Appendix II.

Two soil samples, 7 silt samples and 2 rock samples were taken on the Gran claim. Fifty one soil samples, 225 silt samples, 24 rock geochemical samples, and 10 rock chip-samples were taken on the X-series claims. The GRAN and BY claims were mapped at a scale of 1.5 cm : 100 m, their surface area comprises approximately 750 hectares. The X-series claims were mapped at a scale of 1:20,000; their surface area comprises approximately 2400 hectares.

5. GENERAL GEOLOGY

The rocks discussed in this report form part of the Kechika Trough which is formed of a thick section of shales and silty shales bounded by the Rocky Mountain Trench to the west, platform carbonates to the south and east, and a thick blanket of fluvio-glacial till to the north (southern extension of the Liard Plain).

Most of the published information on the geology of the Kechika Trough is in GSC publications which are of two generations. Preliminary maps by H Gabrielse indicated that the Trough was composed entirely of Ordovician sediments termed the Kechika Group. At that time no evidence for faulting along the Rocky Mountain Trench had been discovered, and the Kechika Group was believed to straddle the trench. Recently (Gabrielse, 1977) it has been recognized that the Trench is the surface expression of a major strike slip fault along which movement has occurred since early Paleozoic time. The stratigraphy of the Kechika Trough has also undergone extensive revision over the past few years and is now recognized to be composed of rocks of Cambrian to Mississippian age (Gabrielse, 1977). The following descriptions are largely derived from Gabrielse and are augmented in Sections 7 and 8 by our own observations.

Table 2 Formations Within the Kechika Trough

Formation or Group	Age	Description
"Black Clastic" Group	Dev-Miss	Chert arenite and pebble conglomerate, polymictic conglomerate, argillite, slate, shale, locally carbonaceous and pyritic.
Road River Formation	Ord-Sil-Dev	Shale, black graptolitic, mainly Ordovician, siltstone, tan, platy, mainly Silurian; sandstone, calcareous shale.
Kechika Group	Camb-Ord	Limestone, wavy banded, silty, nodular; argillaceous limestone; calcareous shale, slate, siltstone.
Atan Group	Upper L Camb	Limestone, thick bedded to massive, locally oolitic and sandy near the base. Black carbonaceous shale near the top.
	Lower L Camb	Sandstone, quartzitic, locally calcareous, siltstone, shale; minor quartz-pebble conglomerate.

5.1 Atan Group

Rocks assigned to the Atan Group underlie the Kechika Trough sediments and are exposed in a linear belt throughout the area. The Group is composed of a distinctive upper bleached crystalline limestone and a lower clastic facies composed mainly of quartzitic sandstones. The base of the Atan rocks, exposed west of Mayfield Lakes, is paraconformable with underlying Helikian sediments (Taylor and Stott, 1973). The upper contact is marked by an abrupt facies change to a thin, black, very carbonaceous shale unit which grades into shales and siltstones of the Kechika Group. Fossil archaeocyathids were found in the limestone north of the GRAN claims which date the Atan as Cambrian; no fossils were found elsewhere by ourselves during the season apart from stromatolitic bioforms within the limestone and tubular burrowings in quartzite just west of the GRAN claims.

5.2 Kechika Group

A wide variety of Lower Paleozoic sediments have, in the past, been assigned to the Kechika Group. Within the report area the Group is composed of dolomitic siltstones, black shales and argillaceous limestone, often characterized by carbonaceous wavy banding. At the base of the Group are thin lenses of black carbonaceous shale. The top of the Group has not been clearly defined within the report area but may be confirmable with, or interfinger with, overlying Road River shales. The rocks are marked by a strong penetrative cleavage of regional, cordilleran orientation.

5.3 Road River Formation

The Road River Formation is a tick section of Ordovician-Silurian shaly sediments where exposed in the type area in the Selwyn Basin, Yukon Territory. There, the unit is host to the large Howard's Pass sedimentary-

diagenetic Pb-Zn deposit. Within the Kechika Trough, a thick section of black share and associated siltstones and calcareous shales has recently been assigned to the Road River Formation (H Gabrielse et al, 1977). These black shales may interfinger with, or overlie, the Kechika siltstones and argillaceous limestones. The upper contact of the Road River shales with the "Black Clastic" Group is not defineable and has not been described in publications.

5.4 "Black Clastic" Group

The "Black Clastic" Group is an informal name for a group of rocks composed of a distinctive chert pebble conglomerate and chert arenite with associated black carbonaceous shales, black slates and chert, locally interbedded with thin black limestone stringers. South of the report area the "Black Clastic" is underlain by the fossiliferous Devonian Dunedin limestone and is itself calcareous. West of Gataga Lakes the "Black Clastic" Group is overlain by Lower Mississippian limestone. Both these relationships are the evidences for dating the clastic Upper Devonian.

6. GEOCHEMISTRY

6.1 X-Series Claims

6.1.i Procedures

Stream sediment samples were taken along all drainages, and tributary streams were sampled wherever possible. Samples were taken of silt from the active stream channel, and where possible sediment was collected from near both banks to ensure a more representative sample.

Supplementary soil sampling was done over areas of little or no outcrop and/or poor drainage, in order to extend the overall sampling coverage. Soil sampling was done on widely separated lines oriented northeast, approximately perpendicular to the geological strike, with a sample spacing

of 100 metres. Some more detailed sampling (15 meter sample spacing) was done in the vicinity of a gossan on the XL claim. Soil samples were taken by first digging a hole, then sampling the B-horizon at an average depth of 15cm.

Samples were placed in high wet strength Kraft paper sampling bags. After drying, they were shipped to Bondar Clegg and Company Ltd., 1500 Pemberton Ave., North Vancouver, B.C., where they were analyzed for copper, lead, zinc and barium (not all samples were analyzed for barium). The samples were dried and sieved to -80 mesh. 0.5 grams of the sample was digested in LeFort aqua regia for 3 hours,then bulked to 20% acid concentration and homogenized, then allowed one hour settling time. Analysis for copper, lead and zinc was by atomic absorption, in constant comparison with both synthetic and matrix standards; results were permanently recorded on chart paper. Analysis for barium was by X-Ray Fluorescence.

Rock samples were taken for geochemical analysis (as outlined above) from rock-types in which Smithsonite had been noted - shale, black chert and the "black clastic", and from many of the tufa deposits (some of which were noted to be quite high in zinc, and thus might be useful as anomalous indicators). Wet assays were done on some rock samples which yielded high values in geochemical analysis, as well as on chip samples taken from mineralized outcrops.

On geological and prospecting traverses, extensive use was made of a chemical which turned bright red when sprayed on outcrops containing oxidized zinc This chemical (referred to as "Zinc-Zap") was made up fresh daily from a solution prepared at Granby's Phoenix assay laboratory, consisting of 30 gm/litre oxalic acid and 5 gm/litre diethylaniline, by mixing with a 5 gm/litre water solution of potassium ferricyanide.

6.1.ii Interpretation

Figs. 2-6 show Zn-Pb-Cu-Ba plots of mostly stream sediment and some soil samples, with stream sample spacing variation a function of creek and side creek frequency, and personal preference.

In all samples, barium values (Fig. 6) are more than zinc (Fig. 3) which are more than copper (Fig. 5) which are more than lead (Fig. 4) in absolute terms, and stream silts are more than soils except.with barium (soil areas are shown on Fig. 2). Barium values are broadly coincident with zinc except in the NW quadrant of the XM claim where they do not reflect a high zinc anomaly. The following is a table of background and anomalous values.

Table 3 Claims Background and Anomalous Silt-Soil Values

a = background b = anomalous c = strongly anomalous

	Zinc ppm			Lead ppm			Copper ppm			Barium ppm		
	a	b	c	a	b	c	a	b	c	a	b	c
Silts	<1000	>2000	>2500	< 20	>60	>100	<60	>75	>90	<1500	>2500	> 3500
Soils	<100	> 250	> 500	< 20	>30	>60	< 20	>30	>50			

By circling the anomalous and strongly anomalous values, zones emerge which are elongated NW-SE, parallel to the regional geological fabric, and the drainages. They are more or less coincident between metals, although there is more tie between zinc and copper than there is between zinc and lead and lead and copper. The only exceptions to the Zn-Cu association are the low copper expressions of the high zincs on the XJ and east XL claims. On the west XN and north XW claims the soil lead values are very high and have lower zinc and copper counterparts.

Relating rock types to anomalies (Figs. 7 and 8) we see that most anomalies are on black and cherty shales, and only a few are on dolomitic shales. However, a further look will also shown that the former is where most samples were taken. In other words, the black shales are recessive and form the valleys and this reflects that our sampling coverage is insufficient at this stage to justify this interpretation.

6.2 GRAN and BY Claims

Reference to Fig 10 shows that only several silt and soil samples were taken on the two claims. Despite the obvious mineralizations upstream of them, they are all singularly low in value, especially for zinc.

7. GEOLOGY OF THE X SERIES CLAIMS

This section describes the various rock units exposed on the X claims. No systematic stratigraphic and structural mapping has been carried out so that the stratigraphic position of the units is poorly defined. Table 4 lists the rock units and reference is made to Figs 7, 8 and 9.

Table 4 Rock Units Exposed on the X Claims

Unit	Description	Group or Formation	Thickness
Unit 7	Conglomerate, sandstone	Unnamed	20m
Unit 6	Travertine	Unnamed	1-10m
Unit 5	Black chert pebble conglomerate cherty arkose, shale	"Black Clastic"	Variable
Unit 4	Chert, interbedded chert and shale, argillite	"Black Clastic" Dev-Miss	Variable
Unit 3	Orange slaty shale, siltstone	"Black Clastic" Dev-Miss	Variable Maximum 50m
Unit 2	Black shale	Unknown	Unknown
Unit 1	Slate, siltstone, shale	Kechika Group Camb-Ord	Greater than 100m

7.1 Unit 1 Kechika Slaty Shales

Distinctive buff and grey weathering slaty siltstones and shales are exposed on the western margin of the claims. Well developed slaty cleavage of regional orientation generally transects their bedding planes. These rocks have been correlated with the Kechika Group on the basis of their lithology for no fossils were found in them. To the east they are in sharp contact with black chert and shale of the "Black Clastic" Group, and

limestone of the Atan Group is not exposed west of them: accordingly the unit is interpreted as a thrust slice in fault contact with the "Black Clastic" Group. A similar interpretation for the Kechika-"Black Clastic" contact exposed south of Gataga Lakes has been made by Gabrielse et al (1977).

7.2 Unit 2 Black Shale

Thick sections of black shale are exposed at numerous localities on the claims. Their exact stratigraphic position is unknown and they may be part of the Ordovician-Silurian Road River Formation or part of the Devonian-Mississippian "Black Clastic" Group. No fossils have been discovered within them. They are black, locally carbonaceous, non-calcareous and generally non-pyritic. No estimate of the thickness of this unit is available.

7.3 Unit 3 Buff Slaty Shales

Thick sections of buff weathering siltstones and shales with local slaty cleavage are exposed on a number of ridges within the claims. These rocks are locally pyritic and dolomitic and usually have wavy argillaceous partings along their bedding planes. They are resistant cliff formers composing the highest ridges within the claims. Thick sections of them are exposed on the prominent ridges crossing the XW and XK claims, and thinner beds of similar lithology are interbedded with chert and black shale on the ridge crossing the XL claim. The stratigraphic position of these rocks is unknown although they are believed to be close to the base of the "Black Clastic" Group.

7.4 Unit 4 Chert

A thick section of black chert is exposed on the ridge striking N 45°W on the XL claim. The chert is massive, unbedded, and has a distinctive yellow-green limonitic stain along fractures; small quartz veinlets are common and locally the chert is very carbonaceous. A similar thick section of chert is exposed on the ridge crossing the XW claim to the southeast.

Thinner chert beds (about 10m thick) are interbedded with blue-grey weathering shales on the ridge striking N 35°E in the southeastern portion of the XJ claim, and on the XK, XM and XL claims. It is possible that these rocks correlate with the massive chert beds but contain less silica cement.

Black carbonaceous chert and carbonaceous shale (sooty shale) are exposed on the XW claim (on claim grid 3N), east of the XW claim and at several other localities on the claims. The chert beds are generally thin (1-2m) and contain a high percentage of carbon. Due to the abrupt competency change between the shale and chert these beds are generally folded, faulted, and brecciated.

The exact stratigraphic position of these chert horizons is unknown. The interbedded black chert and black carbonaceous shale units probably represent deposition in stagnant basin conditions (Pettijohn, 1975). Variations in the chert-shale ratio and carbon content of the cherty units may represent diagenetic or depositional variations in silica and organic material. The presence of angular black chert clasts in the nearby chert pebble conglomerate suggests these beds are at the base of that conglomerate.

Northwest of the XL claim baritic shale is interbedded with black chert and blue-grey weathering shale. These barite beds are composed of white barite blebs along bedding planes separated by thin black argillaceous partings which show syndepositional slump and compactional folding. The baritic beds are composed of thin stringers of barite (about 3 cm) separated by thin stringers and lenses of black shale and argillite. Texturally, the baritic shale is identical to the baritic shale exposed on the Canex Driftpile property several kilometres south, where the unit is host to Pb-Zn mineralization. Although not observed on the X claims, it is likely that the baritic shale is part of the chert-shale unit and that it extends southeast into the claims.

7.5 Unit 5 "Black Clastic"

Unit 5 rocks are exposed on the prominent ridge east of the XW claim and on the XN claim. They consist primarily of chert pebble conglomerate. Medium-fine grained chert arenite and silver-blue-grey weathering siltstone and shale occur near the base.

Clasts in the conglomerate are light grey and black chert, are completely unsorted, and show a complete variation in grain size from pebbles to fine sand. Pebble sized clasts are rounded to subrounded while smaller fragments are generally angular. Distinctive yellow green iron oxides similar to those observed in the chert unit coat their fracture surfaces.

The poor sorting of clasts suggests deposition by a debris flow mechanism. Black chert fragments in the conglomerate may have been derived from immediately underlying black chert but the origin of the more abundant light grey clasts is unknown. Where examined east of the XW claim, the unit shows a coarsening upward trend indicating a progression from low to high energy depositional conditions.

The thickness of the unit varies considerably. East of the XW claim greater than 100m of unrepeated section is exposed.

This unit is the type lithology of the "Black Clastic" Group, dated as Devonian-Mississippian by Gabrielse et al (1977).

7.6 Unit 6 Travertine

Blankets of travertine composed of bedrock scree and organic debris cemented by calcite, smithsonite and iron oxides have formed in many of the creek valleys on the claims; in particular the hanging valley on the XK claim is floored by a thick blanket. The smithsonite component of the rock is locally quite high and samples assay as much as 16% Zn.

7.7 Unit 7 Fluvio-Glacial Fill

A relatively thick (about 20m) unit of semi-consolidated, bedded, fluvio-glacial, boulder conglomerate and thinly bedded sandstone is exposed in the creek valley running north-south along the eastern margin of the XW claim. These rocks probably represent a local base level of erosion during the most recent glacial retreat.

7.8 Structural Geology

No systematic structural mapping was carried out and all structural interpretation has been made from the lithologic mapping and extension of structural styles observed in adjoining areas into the claims area.

South of Gataga Lakes shale and clastic facies of the "Black Clastic" Group show spectacular large scale chevron folding, and it is not known if this structural style extends northwards into the X claims. East of the XW claim large scale open parallel folds are present within the black chert pebble conglomerate and sandstone exposed there. East of the claims area the

Atan limestone cliffs rise vertically trending N 45°W. The limestone is successively repeated numerous times by imbricate thrusts southeast of Through Creek. These thrust faults change with reduced displacement along strike into steeply plunging (SE 45°) isoclinal folds.

This style of structural deformation (thrusting and parallel folding) apparently exits within the X claims, although no large scale structures are recognizably exposed there. On the basis of lithologic correlation the western margin of the claims is interpreted as a thrust fault of regional significance placing Kechika Group rocks of Ordovician age above Devonian "Black Clastic" Group rocks. This interpretation is in agreement with the interpretation by Gabrielse et al (1977) of the same contact exposed south of Gataga Lakes. A large scale anticline plunging steeply south (45°) has been interpreted across the XK and XJ claims, based on repetition of the Buff Shales (Unit 3) exposed there. At the southeast corner of the XL claim black chert and shale show shearing striking north-south and the black chert unit appears to be offset. Accordingly, a fault of unknown displacement has been interpreted.

In conclusion, very little is actually known of the structure of the X claims - numerous small scale folds and faults are exposed but no systematic mapping of these structures has been carried out. Structural mapping, including minor structure observations, cleavage mapping, bedding plane orientation measurements and establishment of stratigraphic marker horizons will clarify the structural setting.

7.9 Smithsonite Occurrences

No significant Pb-Zn sulphide mineralization has yet been discovered on the X series claims, but smithsonite (Zn carbonate) is found at a number of localities.

Fig 8 shows the location of smithsonite occurrences on the X claims and two main showings have so far been discovered. The one on the eastern edge of the XW claim (3 N) consists of small pods of massive smithsonite in a quartz-calcite vein breccia zone within interbedded carbonaceous black chert and shale. The other occurs northwest (along strike) of this showing (XJ 3N 1W) where coarse grained massive sphalerite in a calcite matrix was discovered as float.

Table 5 lists the assay results of rock chip samples from the pods within the showing. Representative sampling across the showing is documented on Figure 9, 7X56R - 7K63R.

Table 5 Assays From XW Claim

Sample No.	Zn%
7X220R	23.8
7X221R	32.9
7X222R	45.2
7X223R	18.4
7X224R	1.8
7X230R	4.55

The very high zinc assays are rock chips from the smithsonite pods. Rock chip samples over several metres of the host shale and cherty beds indicate there is no mineralization within the surrounding rocks. Only very general estimates of the size of the mineralization can be made - pods measure no more than 0.5m x 1m and are present in a surface density less than 1 pod per 10 square metres. A sample (7X455R) of the sphalerite-calcite mineralization found as float on the XJ claim assays 22.7% Zn which may be an average grade for the pods.

A second large showing of smithsonite occurs on the XK claim (4E 2S). There, smithsonite occurs along fractures and cleavage planes of black shale. A rock chip sample over 20 metres (LL56R; see Figs.2,9) of this outcrop assays 0.24% Zn, indicating that the Zn mineralization is confined to fracturs and cleavage planes and is not pervasive throughout the shale.

Numerous other smithsonite showings are present on the claims. On the XJ claim (2N 4W) a small pod of shale containing smithsonite on the surface assays 4.6% Zn. On the XL claim (1N 1W) fractures in a chert horizon are coated with smithsonite. At many localities on the claims (Fig 8), travertine contains smithsonite as a cement. Table 6 summarizes assays of this travertine.

Table 6 Travertine Assays

Sample No.	Zn %	Pb ppm	Cu ppm	Location
7L101R	16.7	6	16	"Tufa Valley"
7L103R	2.3	3	30	XM Claim
7L107R	1.9	2	9	"
7W67R	0.004	2	5	"
7W107R	1.6	26	40	"
7W110R	1.1	7	17	"
7W111R	2.3	10	18	"
7W114R	0.26	8	18	"
7X144R	2%	2	--	"
7X145R	2%	2	--	"
7X146R	2%	2	--	"
7X147R	0.77	8	--	"
7X149R	2%	2	--	"

8. GEOLOGY OF THE GRAN AND BY CLAIMS

The GRAN and BY mineralizations are on the Cambrian limestone-shale contact only several kilometres west of Mayfield Lakes and were discovered early in the season. Because of this and also because they cover a far smaller area of ground than the X claims, our knowledge of them is, in a sense, appropriately better, although we had neither time nor the satisfactory topographical control to unravel the problems involved with intermediate detail. Table 7 lists the rock units exposed on the claims, and reference is made to Fig 9.

Table 7 Rock Units Exposed on the GRAN and BY Claims

Unit	Description	Group or Formation	Thickness
6	Black pyritic shale	Kechika Group (Cambro-Ordovician)	20m?
5	Black, calc-non calc, non pyritic shale		30m?
4	Black-buff weathering, dolomitic shale		100m?
3	Medium-dark grey locally pyritic shale		
2	Massive, light grey limestone, locally brecciated and limonitic	Atan Group Limestone (Upper Cambrian)	300m
1	Sandstones and quartzites	Lower Atan Group or Hadrynian	50m

8.1 Units 1 and 2 Atan Group

The Lower Atan Group arenite beds on the GRAN claim are among the oldest rocks we encountered in Gataga; they are exposed on the western edge of the GRAN 2S-3S claim grid. There, they are a dark grey-black, medium coarse grained, crudely bedded sandstone-quartzite which is considerably fractured by the folding stress of the anticline which brings it to surface.

The Upper Atan Group limestone rests conformably (?) on the arenite and represents a continuing littoral depositional environment as initiated by the latter. Its general lithological character is described in section 5.1. On the GRAN and BY claims it forms a massive, thickly bedded, bleached deposit, with solution collapse brecciation accompanied by limonitic staining occurring in places near the upper contact (GRAN OW 1-2S and BY 1E OS). Secondary calcite veinlets are common in places. It forms rugged and precipitous cliff topography with ridge alignment parallel to the regional trend. Its contact with the overlying shales is quite abrupt.

8.2 Units 3-6 Kechika Group

The shales form the recessive saddles and valleys between the folded limbs of the limestone outcrops, and are covered by an unsorted and mixed blanket of frost heaved boulders, talus and stream debris (colluvium) in the valley floors which is a problem to both geology and prospecting. The one complete section (traverse K-6, GRAN 0-2E 1S) shows them to be alternating, thinly bedded, buff-weathering, silty, wavy banded, dolomitic shales, and grey-blue-black, non-calcareous, locally pyritic shales, all penetrated by a strong regional cleavage. Thin argillaceous limestones are occasionally intercalated in these shales, as occurs elsewhere in the Group, but they are less carbonaceous than further west in the clastic belt (a "black clay" occurs on the limestone-shale contact near GRAN grid OW 1.5S but is considered to be tectonic). Thin quartz-calcite veinlets are common but not pervasive, and occasionally veins occur up to 30 cm wide, aligned parallel to the cleavage. Pyrite occurs in finely disseminated form, as small crystals, and occasionally in nodules. There is a tendency for the blacker shales to be more thinly laminated, occasionally book-like, than the dolomitic shales.

8.3 Structural Geology

The claims straddle an overturned syncline of Kechika shales pinched between Atan limestone, with a smaller anticline parasitic to this on the west of the GRAN claims which exposes the Atan arenite described above (Fig 9). There may also be other lesser folds - for example the limestone-shale outcrop pattern in the main area of mineralization (GRAN 2E 2S) could be interpreted as a mini anticline-syncline pair with a steep northerly plunge. The main syncline is overturned to the northeast so that all dips and cleavage are southwest, and the western anticline plunges both north and

south, making it into an elongated dome. Regional axial plane cleavage is dependent upon this folding in the incompetent Kechika shales, but fracturing has developed as its counterpart in the competent Atan arenite. One would suspect small scale isoclinal, or chevron folding, in the shales, too, but it has not been conclusively observed.

8.4 Sphalerite Occurrences

As with the X claims, no significant mineralization in mining terms has been found on the claims.

The main showing occurs near GRAN grid 2E 2S in dark grey, thinly laminated shales near the limestone contact, in association with numerous calcite stringers and quartz veinlets. Sphalerite with smithsonite alteration occurs in 1-5 mm crystals along bedding planes. The showing ranges in width from 10-30 cm and attains a strike length of about 70 m, based on tracing angular float material between the protruding outcrops at each end.

A similar showing at the same stratigraphic horizon occurs about 800 m downstream at 3E 3S but is much smaller in extent, measuring a few metres by a few centimetres. A sample (7K1R) assays 11.45% Zn. A few spotty mineralizations occur between these two showings in a tiny tributary gully (2.5E 2.5S). Altogether, then, some 1000 m of strike have observable sphalerite mineralization present.

Mineralization also occurs in the limestone close to the shale contact in small pods at GRAN grid 2E 2S and GRAN OW 5S. Mineralization has not been seen in the breccia structures on the claims.

9. CONCLUSIONS AND RECOMMENDATIONS

9.1 The presence of general geochemical and some higher grade smithsonite and sphalerite concentrations of zinc has been demonstrated in a baritic clastic sequence on the X series claims, and near a limestone-shale contact on the GRAN and BY claims.

9.2 More detailed geological mapping and soil sampling is advised on all claims.

J H B Wilkins B Sc DIC

3 November 1977

JHBW/emb

10. SELECTED REFERENCES

Carne R C	Geology of the Tom and Jason Zinc-Lead-Barite Deposit, MacMillan Pass, Y T Dept Indian & Northern Affairs 1976 GSC OF EGS 1976-16
Gabrielse H, Dodds C J, Mansay J L	Operation Finlay, British Columbia Dept of Activities Part A GSC paper 77-1A pp 243-246 Also maps in OF 483 Geology of Ware West Half 1977
Jackson D E, Steen G, Sykes D	Stratigraphy and graptolite zonation of the Kechika and Sandpile Groups in northeastern British Columbia Bull Can Pet Geol v 13, No 1, pp 139-154
Pelzer E E	Mineralogy geochemistry & stratigraphy of the Besa River Shale, British Columbia Bull Can Pet Geol, v 14, No 2, 1966, pp 273-321
Sangster D F	The Significance of Smithsonite in Northern Cordillera GSC paper 75-1, part A, pp 235-237
Taylor G C, Stott D F	Tuchodi Lakes map area GSC OF 1971
Vine J D, Tourtelot E B	Geochemistry of Black Shale Deposits - A Summary Report Econ Geol, v 65, 1970, pp 253-272
Wise H M	Canex Placer Assessment Report #5359 on the Geology & Geochemistry of the Driftpile Creek Property 1974 (also J M Kowalchuk & R A Rivera 1976)

APPENDIX 1 STATEMENT OF QUALIFICATIONS

DONALD JAMES	Exploration Manager of Granby Mining Corporation since 1967.
HUN KIM	BSc Geology 1958 Seoul National University. Geologist with Granby since 1969, with Dai-Han Coal Corporation 1958-1969.
ROBERT MAXWELL	BSc Queens Kingston 1974, MSc UBC 1976, various programmes with Rio Tinto, Texaco and Texas Gulf.
ROBERT ROLLINGS	Draughtsman with Granby since 1974, previously with Agilis Engineering and Rio Tinto Canadian Exploration Ltd.
LORNE WARREN	Prospector with Granby since 1971 and previously with Manex and on own behalf.
JOHN WILKINS	BSc Hull University UK 1960, DIC RSM 1968 Geologist with Granby since 1976, previously with Union Carbide Exploration Corporation, Mackay and Schnellmann, London, UK, and African Manganese Co., Ghana, Project party chief.
WILLIAM WILKINSON	BSc Geology UBC 1966. Geologist with Granby since 1970, previously with Dolmage Campbell & Associates, and Mt Nansen Mines.

APPENDIX II COST SUMMARY

1. Personnel

X Claims	Geology	Geochemical Sampling	Days	Day Charge	Total	
James	July 2,4 (2)	0	2	$ 180	$ 360	
Kim	June 18,21,25, July 1(4)	July 3,4,6(3)	7	116	812	
Maxwell	June 18,20,21, July 1(4)	July 3,4,5(3)	7	121	847	
Rollings	June 18, July 1 (2)	July 3,4,6(4)	6	73	438	
Warren	June 17,18, July 1 (30)	July 3,4, (2)	5	80	400	
Wilkins	June 18,20,23,25 July 2(5)	July 3,4 (2)	7	125	875	
Wilkinson	June 17,18,25 July 1 (4)	July 3,4 (2)	6	130	780	
			40		4,512	4,512

GRAN & BY Claims

James	July 1	1	180	180	
Kim	June 10,11,12,28 July 2,5	6	116	696	
Maxwell	June 8,10,11	3	121	363	
Rollings	June 10,11,12,28, July 2,5	6	73	438	
Warren	June 8,9,10,11	4	80	320	
Wilkins	June 9, July 1	2	125	250	
		22		2,247	2,247

2. FOOD AND ACCOMMODATION

Groceries

Man days - 62 technical crew		
40 pilot and cook		
102 @ $25 man/day	2550	
Cook salary - 20 days @ $60	1200	
Camp equipment and lumber apportioned	1850	
Commercial meals apportioned 10 man days @ 20	200	
Commercial lodging apportioned 10 man days @ 20	200	
	6,000	6,000

3. GROUND TRANSPORTATION

Canadian Freightways haulage apportioned	100	
Two 3/4 ton pick up costs apportioned	600	
	700	700

4. PUBLIC AIR FARES

Apportioned return air fares Vancouver-Watson Lake	800	800

5. CHARTER AIRCRAFT

Northern Mountain Helicopters

X Claims 48.3 hours @ $192/hr incl. fuel	9274	
GRAN and BY Claims 13.4 hours @ $192/hr	2573	
	11,847	
B.C. & Yukon Air Services		
Fixed wing expediting and mob/demob apportioned	2,166	14,013

6. ASSAYS

1. X Claims

Rock geochem. :	18 Cu-Pb-Zn @ 3.00	54.00		
	6 Cu-Pb-Zn-Ba @ .00	36.00		
Soil/Silt geochem. :	276 Cu-Pb-Zn @ 3.00	828.00		
	255 Ba @ 3.00	765.00		
Wet Assays:	21 Zn. @ 5.50	115.50		
	11 Cu-Pb-Zn @ 15.50	170.50		
	2 Pb-Zn @ 11.00	22.00		
	1 Cu-Pb-Zn-Ba @ 25.00	25.00		
	Total	$2,016.00	2,016	2,016.

2. Gran Claims

Soil/Silt geochem :	9 Cu-Pb-Zn @ 3.00	27.00		
Rock Assays :	2 Cu-Pb-Zn @15.50	31.00		
		58.00	58	
3. Zinc Zap and heavy metals kit apportioned			400	
			2,474	2,474

7. REPORT PREPARATION

J.H B Wilkins	15 days @ $125	1,875	
Draftsman	15 days @ 73	1,095	
Typist	5 days @ 53	265	
Reproduction costs and bindings		150	
		3,385	3,385
	GRAND TOTAL		$ 34,131

8. SUBDIVISION OF COSTS

1. General Costs

Food and accomodation	$ 6,000
Ground transportation	700
Air fares	800
Fixed wing	2,166
Zinc zap supplies	400
Report preparation	3,385
Total	$13,451

2. BY, GRAN Claims

Labour (33.2% of total labour)	$ 2,247
Helicopter	2,573
Assays	58
33.2% of general costs (above)	4,469
Total	$ 9,347

3. X Claims

Labour (66.8% of total labour)	$ 4,512
Helicopter	9,274
Assays	2,016
66.8% of general costs (above)	8,982
Total	$24,784
(amount per unit $258)	
Grand total	$34,131

APPENDIX III

Granby Mining Corporation

February 14, 1978

Bondar Clegg & Co., Ltd.
1500 Pemberton Avenue
North Vancouver, B.C.

Dear Sirs,

In connection with soil and silt samples analysed last summer for Zn, Pb, Cu and Ba we request that you supply us with a letter or brochure which will supply the information required under subsection 9, section 7 Geochemical Reports in the new Mineral Act Regulations.

Yours very truly,

D. H. James
Manager Exploration

DHJ/tv

Don -
See attached

17TH FLOOR • 1050 WEST PENDER STREET • VANCOUVER, BRITISH COLUMBIA V6E 2H7 • TELEPHONE (604) 683-0451 • TELEX 04-508-703 • TWX 610-929-1096

Method of Determination for Cu, Pb, Zn, Mo, Ni, Co, Cd, Fe, and Mn (semi-quant.).

Samples are:

1. Dried in infra-red driers
2. Sieved to -80 mesh
3. Weighed on 0.5 gm.
4. Digested in LeFort aqua regia for three hours or per arrangement with clients.
5. Bulked to 20% acid concentration and homogenized.
6. Allowed one hour setting time
7. Analyzed by atomic absorption in constant comparison with both synthetic and matrix standards.
8. Permanently recorded on chart paper.

Ba is analyzed by XRay Fluorescence.

Ken Bright, Geol. B.

Form No. Z 1-220

WILSON STATIONERS

Canada

Province of British Columbia

To Wit:

In the Matter of

I, Donald H. James, P. Eng. , of Vancouver

in the Province of British Columbia.

Do Solemnly Declare that expenditures in connection with the attached report, "Geology and Geochemistry of the XM, XN, BY, GRAN, XW, XJ, XK, XL Mineral Claims, Record Nos. 407-414", are as detailed in Appendix II of this report, and amount in total to $34,131.

And I make this solemn Declaration conscientiously believing it to be true, and knowing that it is of the same force and effect as if made under oath, and by virtue of the Canada Evidence Act.

Declared before me

at

in the Province of British Columbia.

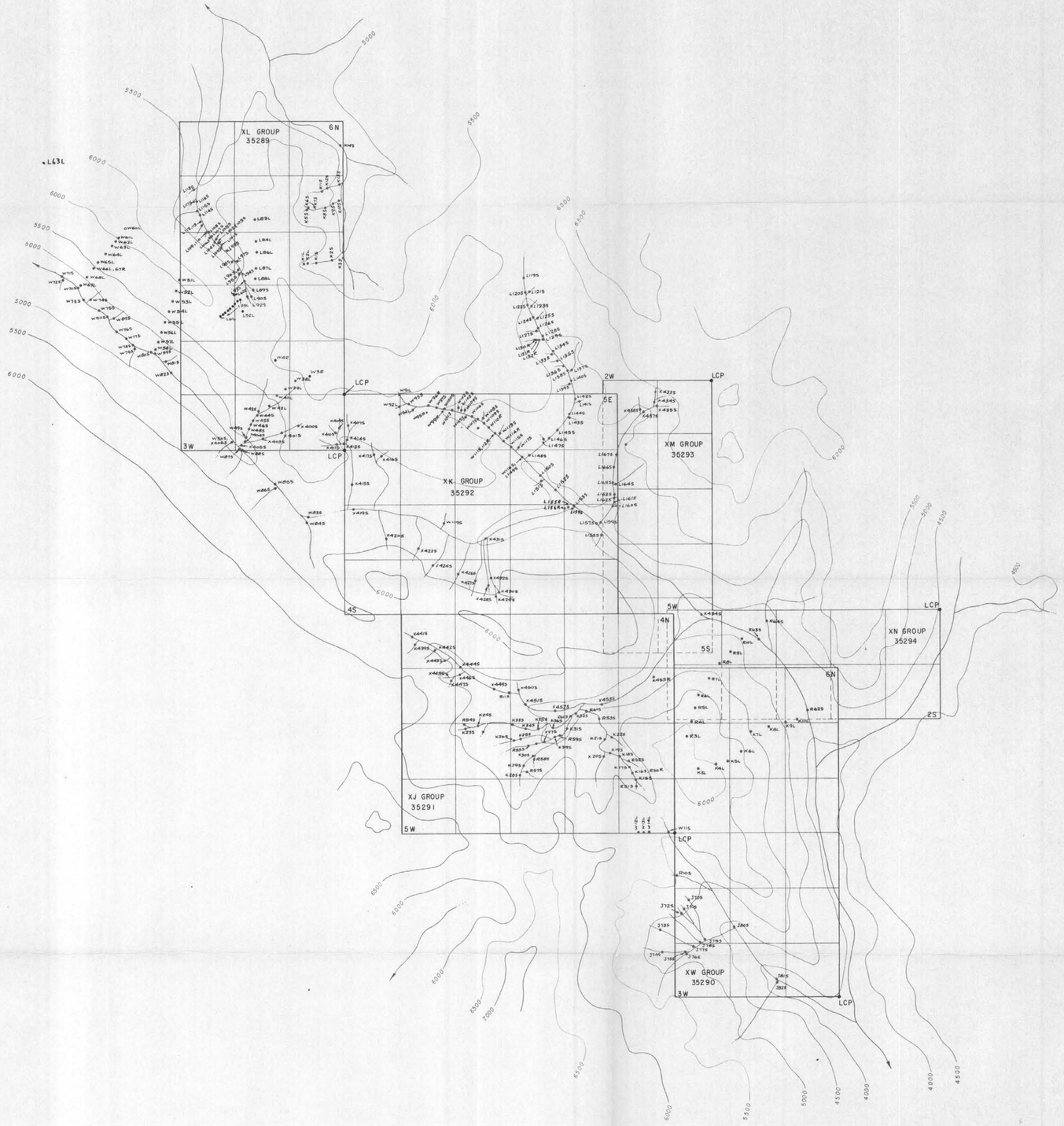
this 26 day of

April A.D. 1978

D H James

A Notary Public in and for the Province of British Columbia
A Commissioner for taking affidavits for British Columbia

SUB-RECORDER



N

SCALE IN METERS

500 0 500 1000

SAMPLE TYPES

Suffix series	S	STREAM SAMPLES
" "	L	SOIL SAMPLES
" "	R	ROCK SAMPLES

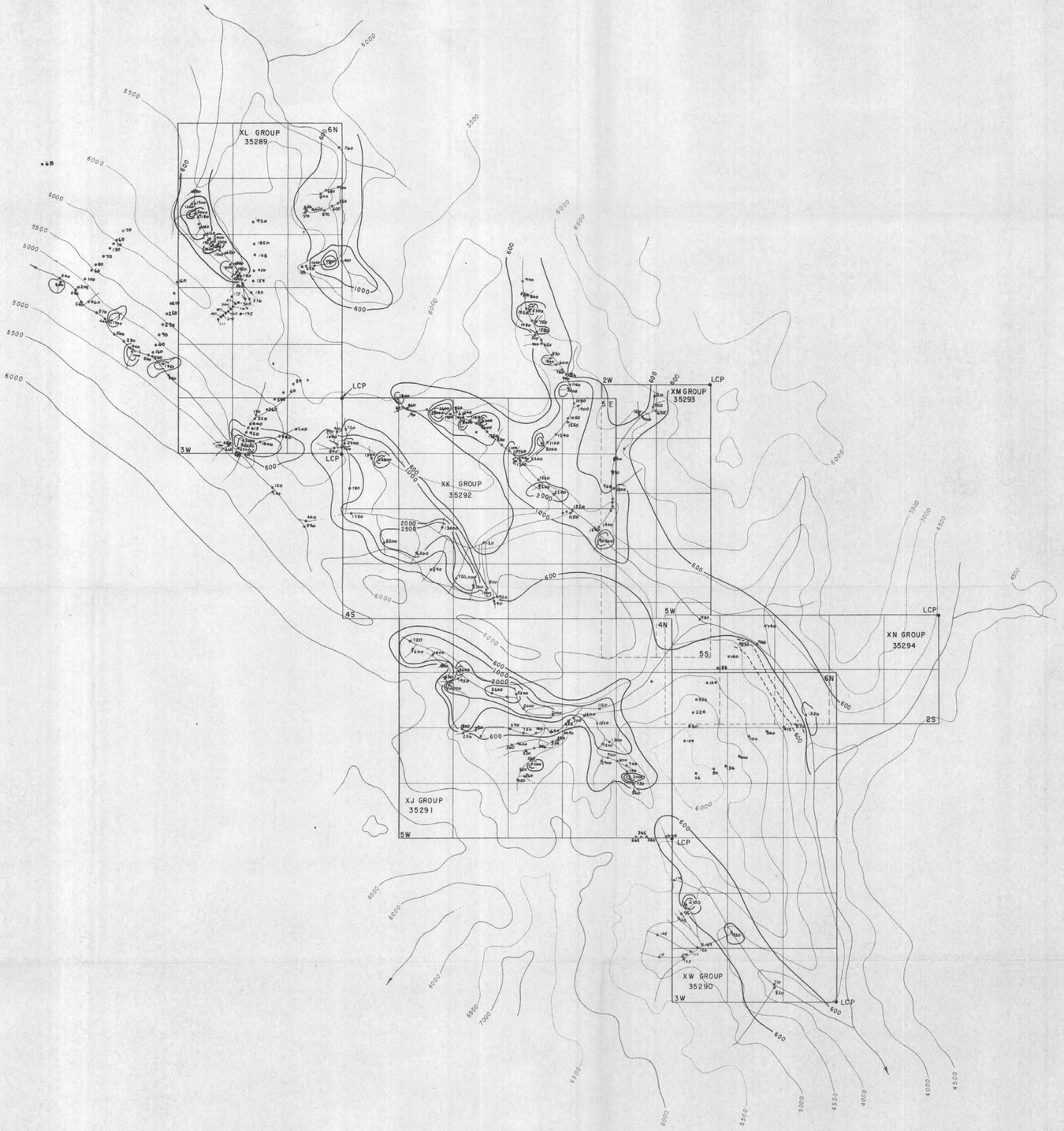
SAMPLERS

Prefix series	K & R	H. KIM & R. ROLLINGS
" "	J	J. WILKINS
" "	X	R. MAXWELL
" "	L	L. WARREN
" "	W	B. WILKINSON

Note: CLAIMS LOCATED BY COMPASS & TOPOFIL

VANCAL

DATE REVISED	BY	DRAWN BY: RWR	GRANBY MINING CORPORATION	TITLE 'X' CLAIM GROUPS STREAM & SOIL SAMPLE LOCATION MAP
		CHECKED	PROJECT: N.E.B.C. (338)	NO. FIGURE 2
		APPROVED	SCALE: 1: 20000	
		DATE OCT, 1977		



N

SCALE IN METERS

500 0 500 1000

PROPERTY ZINC GEOCHEMISTRY

- ☐ ≥600 PPM IN SOIL SAMPLES
- ☐ ≥600 PPM IN STREAM SEDIMENT SAMPLES
- ☐ ≥1000 PPM " " " "
- ☐ ≥2000 PPM " " " "
- ☐ ≥2500 PPM " " " "

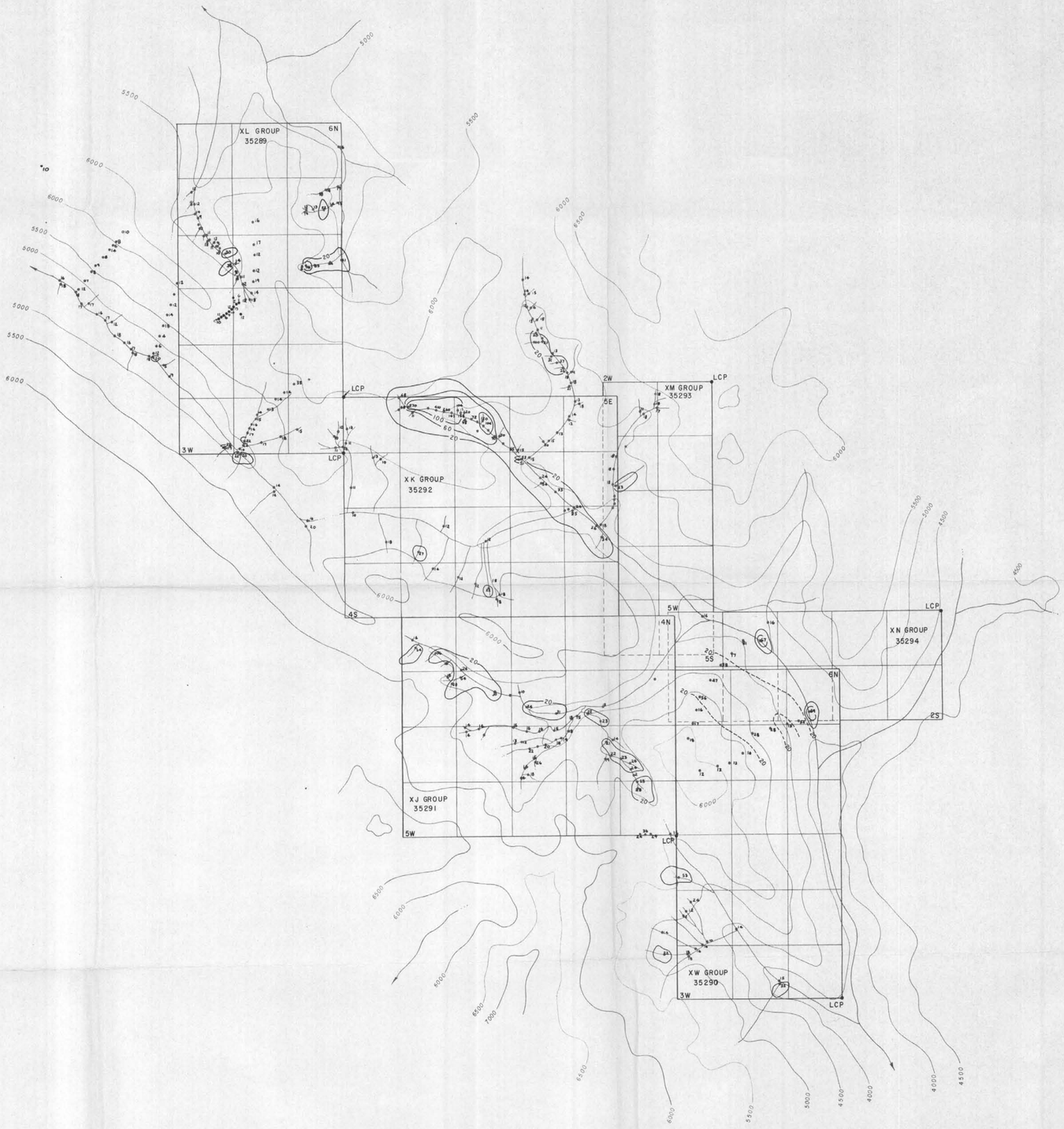
Note : CLAIMS LOCATED BY COMPASS & TOPOFIL

VANCAL

DATE REVISED	BY	DRAWN BY: RM
		CHECKED
		APPROVED
		DATE OCT, 1977

GRANBY MINING CORPORATION
PROJECT: N.E.B.C. (338)
SCALE: 1 : 20000

TITLE 'X' CLAIM GROUPS
ZINC GEOCHEMISTRY
NO. FIGURE 3



N

SCALE IN METERS
500 0 500 1000

PROPERTY LEAD GEOCHEMISTRY

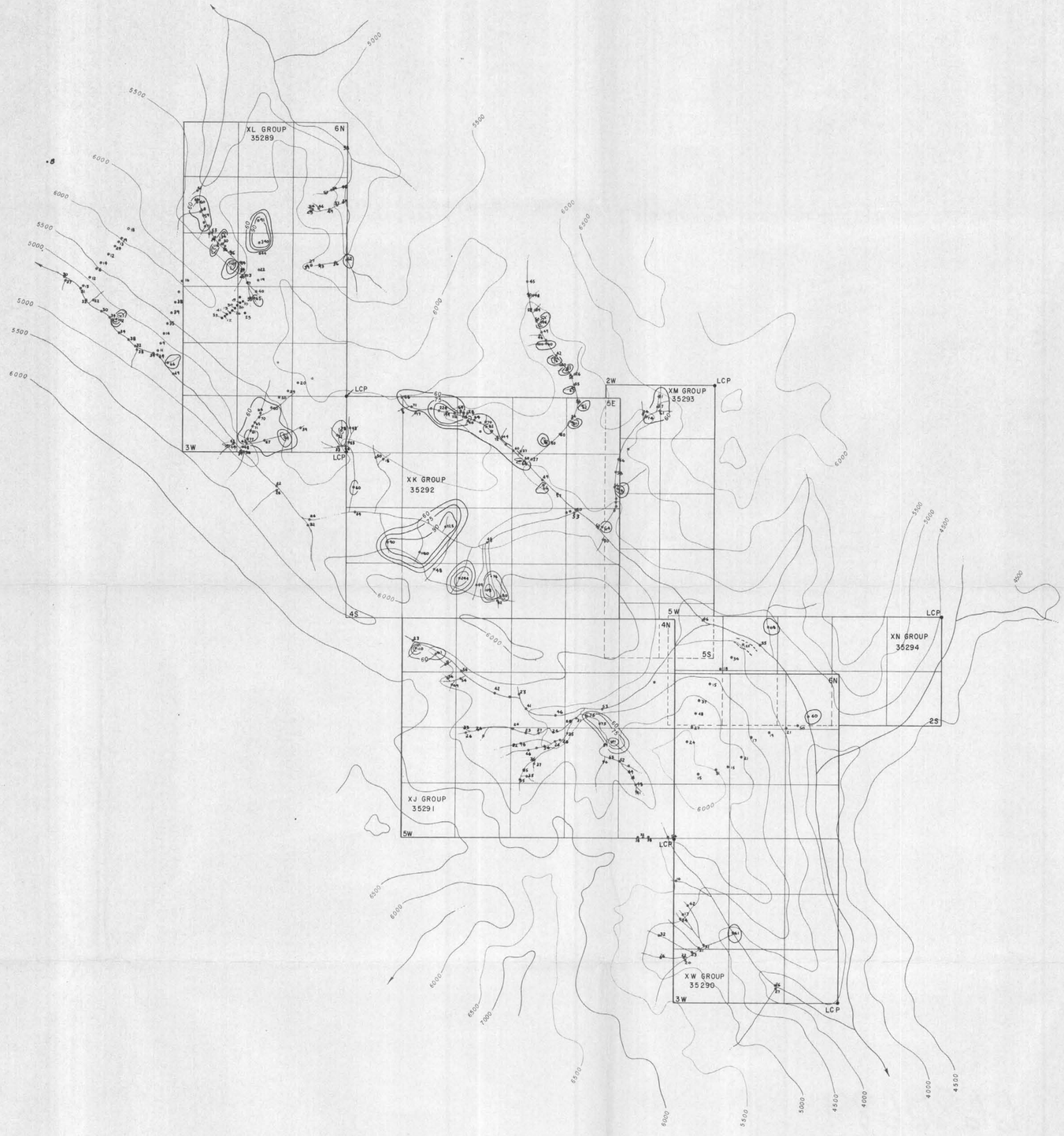
- ≥ 20 PPM IN SOIL SAMPLES
- ≥ 20 PPM IN STREAM SEDIMENT SAMPLES
- ≥ 60 PPM " " " "
- ≥ 100 PPM " " " "

Note : CLAIMS LOCATED BY COMPASS & TOPOFIL

MINERAL RESOURCES BRANCH
ASSESSMENT REPORT
6689
NO.

DATE REVISED	BY	DRAWN BY: RM	GRANBY MINING CORPORATION	TITLE 'X' CLAIM GROUPS LEAD GEOCHEMISTRY
		CHECKED	PROJECT: N.E.B.C. (338)	NO. FIGURE 4
		APPROVED	SCALE: 1 : 20000	
		DATE OCT, 1977		

VANCAL



N

SCALE IN METERS
500 0 500 1000

PROPERTY COPPER GEOCHEMISTRY

- ≥ 60 PPM IN SOIL SAMPLES
- ≥ 60 PPM IN STREAM SEDIMENT SAMPLES
- ≥ 75 PPM " " " "
- ≥ 100 PPM " " " "

Note: CLAIMS LOCATED BY COMPASS & TOPOFIL

MINERAL RESOURCES BRANCH
ASSESSMENT REPORT
6689
NO.

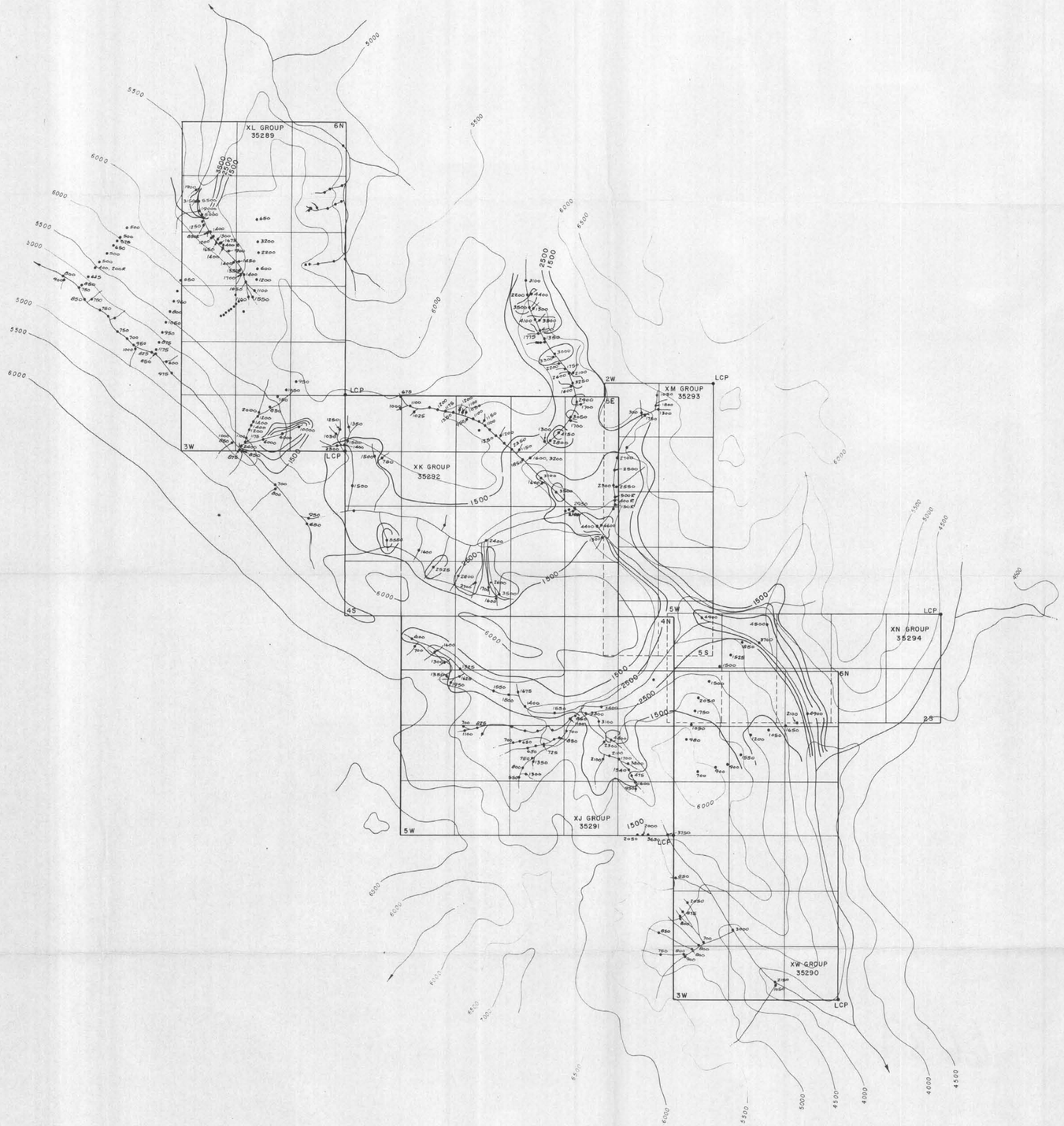
VANCAL

DATE REVISED	BY	DRAWN BY: RM
		CHECKED
		APPROVED
		DATE OCT 1977

GRANBY MINING CORPORATION
PROJECT: N.E.B.C. (338)
SCALE: 1 : 20000

TITLE 'X' CLAIM GROUPS
COPPER GEOCHEMISTRY

NO. FIGURE 5



N

SCALE IN METERS
500 0 500 1000

PROPERTY BARIUM GEOCHEMISTRY

- ≥ 1500 PPM IN SOIL SAMPLES
- ≥ 1500 PPM IN STREAM SEDIMENT SAMPLES
- ≥ 2500 PPM " " " "
- ≥ 3500 PPM " " " "

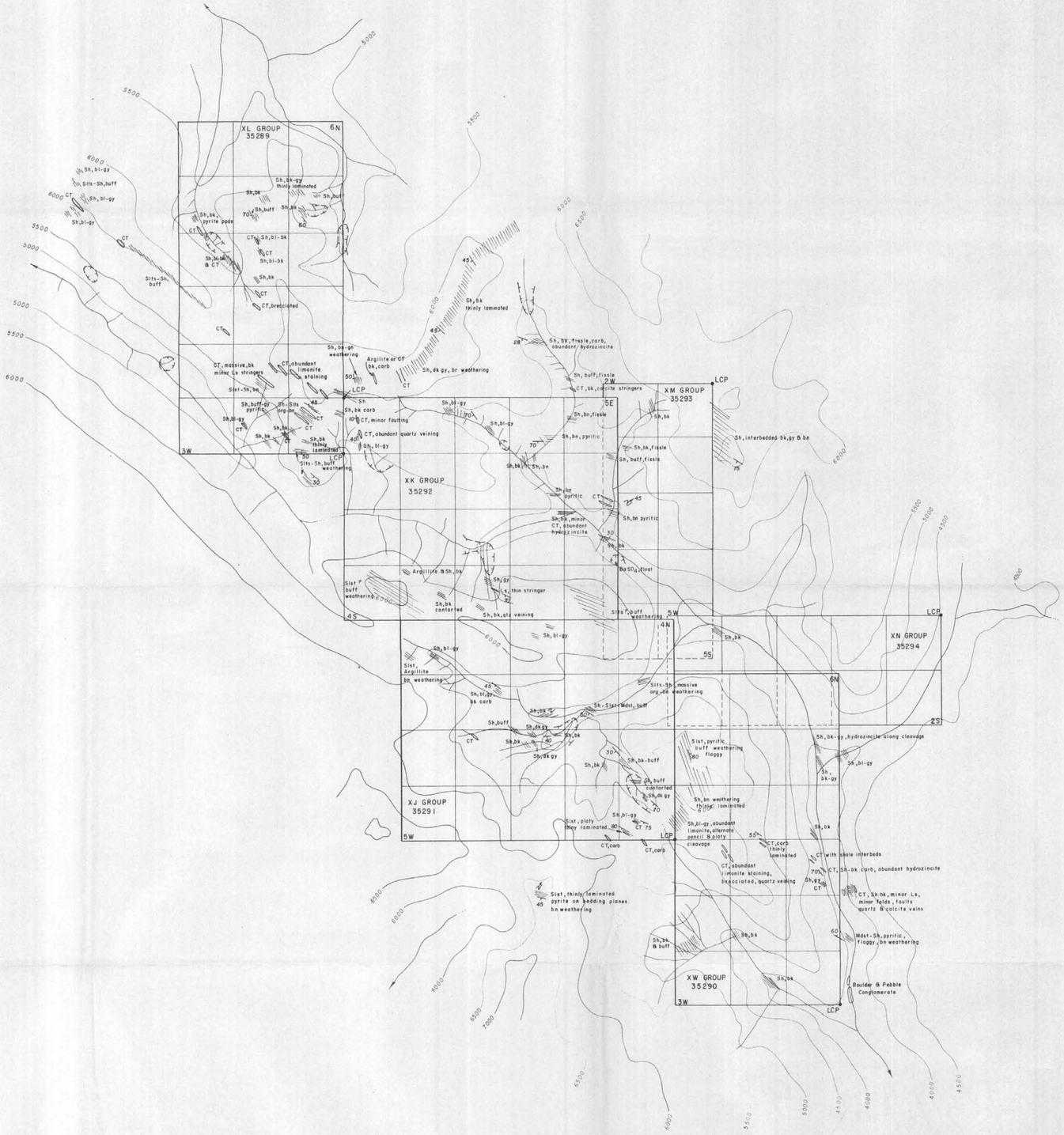
Note: CLAIMS LOCATED BY COMPASS & TOPOFIL

VANCAL

DATE REVISED	BY	DRAWN BY: RWR
		CHECKED
		APPROVED
		DATE FEB. 1978

GRANBY MINING CORPORATION
PROJECT: N.E.B.C. (338)
SCALE: 1 20000

TITLE 'X' CLAIM GROUPS
BARIUM GEOCHEMISTRY
NO. FIGURE 6



LEGEND:

ROCK TYPES

- CT - Chert
- Mdst - Mudstone
- Sh - Shale
- Slst - Siltstone
- $BaSO_4$ - Barite
- Travertine

ROCK COLORS

- bk - Black
- bl - Blue
- bn - Brown
- gy - Grey
- org - Orange
- dk - Dark

60/ Bedding strike & dip

45 Folding arrow indicates plunge

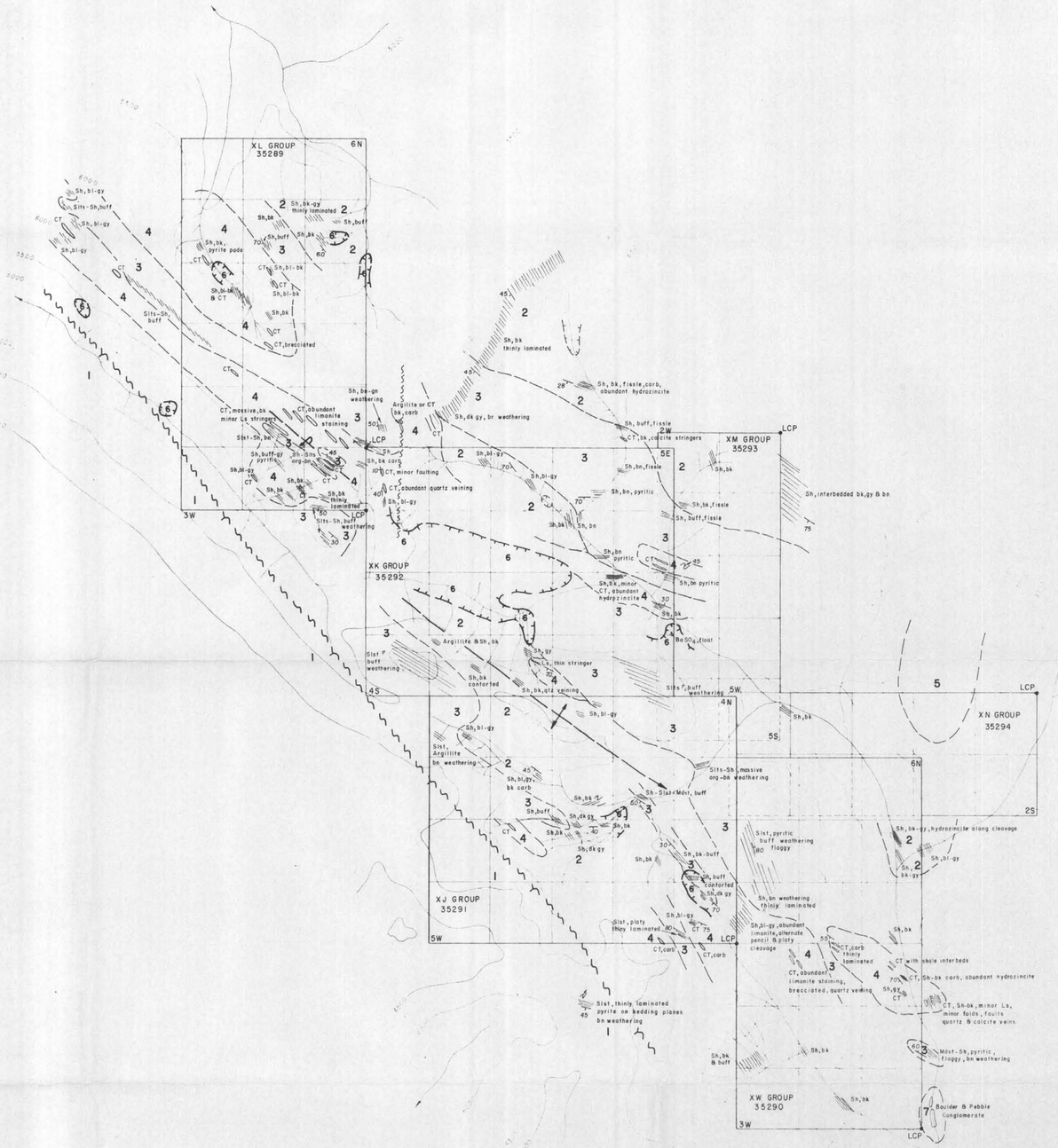
Note: CLAIMS LOCATED BY COMPASS & TOPOFIL

DATE REVISED	BY		
		DRAWN BY: RM.	GRANBY MINING CORPORATION
		CHECKED:	PROJECT: N.E.B.C. (338)
		APPROVED:	SCALE: 1: 20000
		DATE OCT, 1977	

TITLE 'X' CLAIM GROUPS GEOLOGY NOTES

NO. FIGURE 7

VANCAL



N

SCALE IN METERS
500 0 500 1000

LEGEND :

(Unnamed)
7 Conglomerate , sandstone

(Unnamed)
6 Travertine

"BLACK CLASTIC" (Dev - Miss)
5 Black chert pebble conglomerate , cherty arkose , shale

4 Chert , interbedded chert and shale , argillite

3 Orange slaty shale , siltstone

(Unknown)
2 Black shale (Unknown)

KECHIKA GROUP (Camb - Ord)
1 Slate , siltstone , shale

ROCK TYPES
CT - Chert
Mdst - Mudstone
Sh - Shale
Slst - Siltstone
$BaSO_4$ - Barite

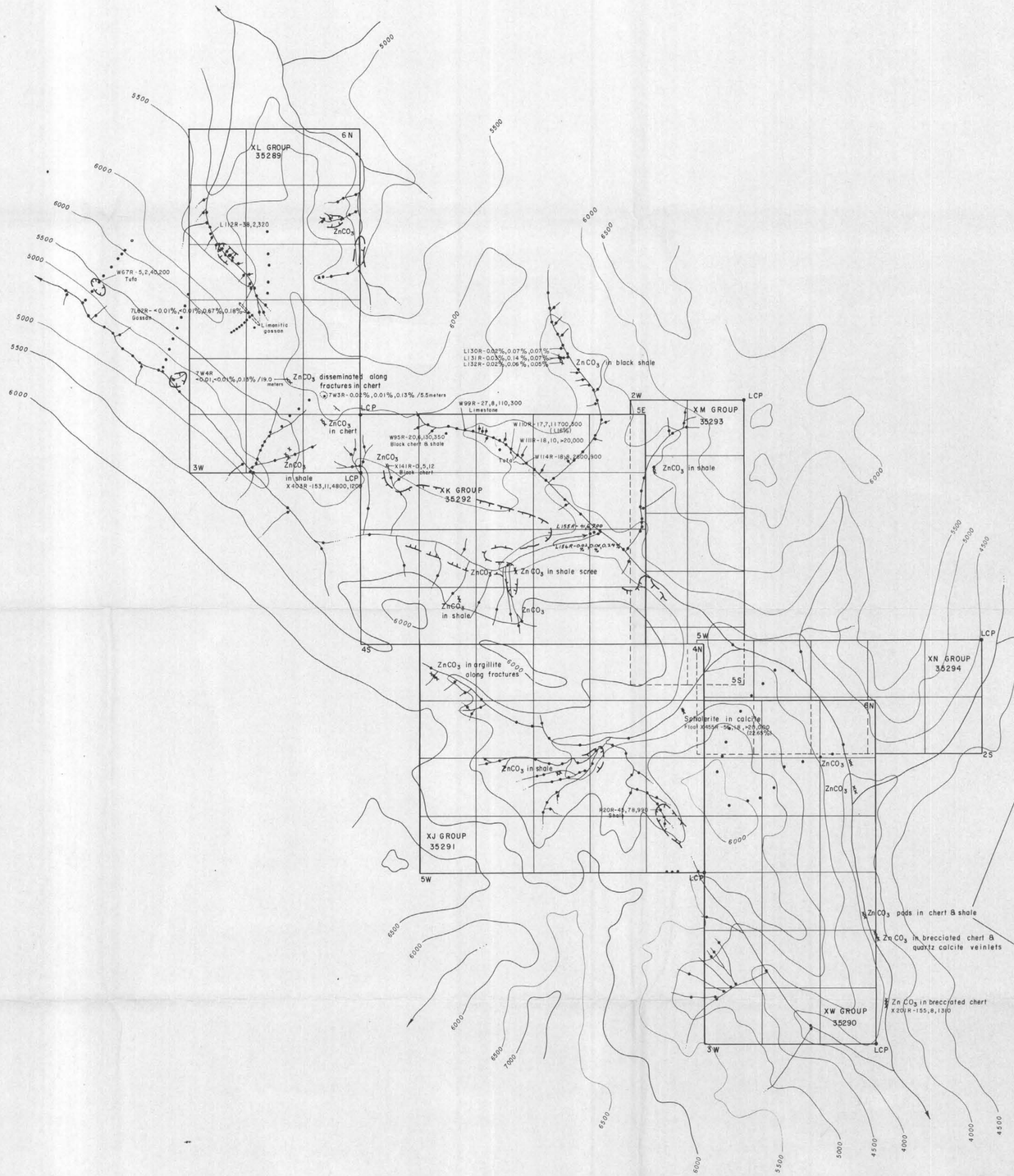
ROCK COLORS
bk - Black
bl - Blue
bn - Brown
gy - Grey
org - Orange
dk - Dark

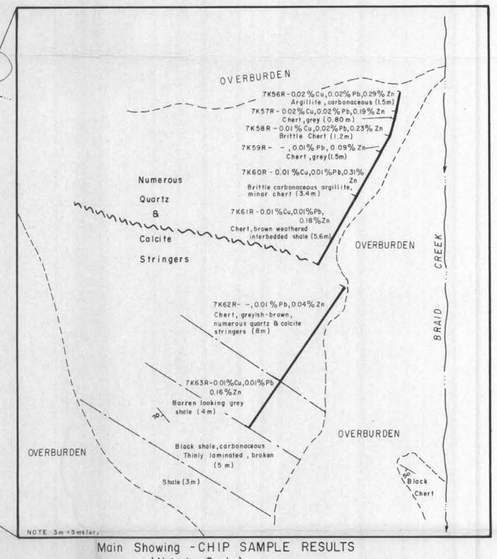
60 Bedding strike & dip
45 Folding arrow indicates plunge
Anticline , overturned

Note : CLAIMS LOCATED BY COMPASS & TOPOFIL

VanCal

DATE REVISED	BY	DRAWN BY	ZM.	GRANBY MINING CORPORATION	TITLE 'X' CLAIM GROUPS INTERPRETED GEOLOGY MAP
		CHECKED		PROJECT N.E.B.C. (3581)	
		APPROVED		SCALE 1: 20000	NO. FIGURE 8
		DATE	OCT 1977		





Main Showing - CHIP SAMPLE RESULTS
(Not to Scale)

LEGEND:

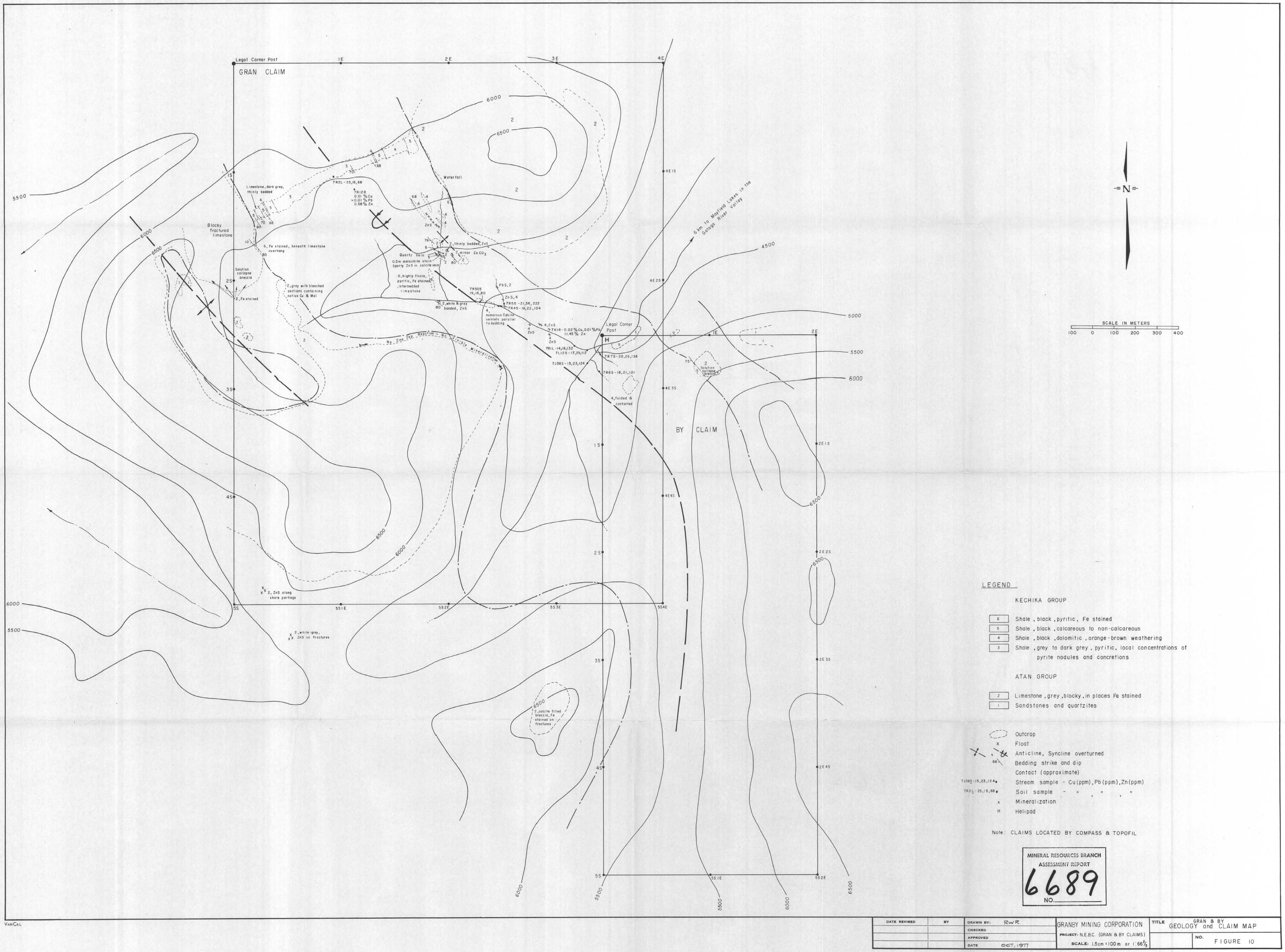
Extent of travertine occurances

Note: CLAIMS LOCATED BY COMPASS & TOPOFIL

*W67R-5,2,40,200 Sample No.-Cu, Pb, Zn, Ba (ppm) or % where indicated
(Zn%) — Assay result for sample >10,000ppm

DATE REVISED	BY	DRAWN BY: RM.	GRANBY MINING CORPORATION	TITLE 'X' CLAIM GROUPS SMITHSONITE ($ZnCO_3$) SHOWINGS
		CHECKED		
		APPROVED	PROJECT: N.E.B.C. (338)	NO. FIGURE 9
		DATE OCT, 1977	SCALE: 1:20000	

VANCAL



GRAN CLAIM
BY CLAIM
Legal Corner Post
N
SCALE IN METERS
100 0 100 200 300 400
6 km to Mayfield Lakes in the Gataga River Valley
Waterfall
Quartz Vein
Blocky fractured limestone
Limestone, dark grey, thinly bedded
Solution collapse breccia
LEGEND:
KECHIKA GROUP
6 Shale, black, pyritic, Fe stained
5 Shale, black, calcareous to non-calcareous
4 Shale, black, dolomitic, orange-brown weathering
3 Shale, grey to dark grey, pyritic, local concentrations of pyrite nodules and concretions
ATAN GROUP
2 Limestone, grey, blocky, in places Fe stained
1 Sandstones and quartzites
Outcrop
Float
Anticline, Syncline overturned
Bedding strike and dip
Contact (approximate)
7J38S-15,23,124 Stream sample - Cu(ppm), Pb(ppm), Zn(ppm)
7R2L-25,16,68 Soil sample - " , " , "
Mineralization
Helipad
Note: CLAIMS LOCATED BY COMPASS & TOPOFIL
MINERAL RESOURCES BRANCH
ASSESSMENT REPORT
6689
NO.
DATE REVISED
BY
DRAWN BY: RWR
CHECKED
APPROVED
DATE OCT, 1977
GRANBY MINING CORPORATION
PROJECT: N.E.B.C. (GRAN & BY CLAIMS)
SCALE: 1.5cm = 100 m or 1:66⅔
TITLE GRAN & BY GEOLOGY and CLAIM MAP
NO. FIGURE 10
VanCal