4157

92I/10E

PHOTOGEOLOGICAL REPORT

TECTONIC ANALYSIS OF FRACTURE DENSITY

CORRELATION OF AIRBORNE ISOMAGNETIC SURVEY

for

DELTA INTERNATIONAL MINERALS LTD.

"A" CLAIM GROUP

CHERRY CREEK AREA, KAMLOOPS M.D.

BRITISH COLUMBIA

50°121° SW

Name of Claim	Record Number	Expiry Date
EX 9 & 11	103163 & 103165	January 18, 1973
EX 19 to 26	103173 - 193180	January 18, 1973
At 1 to 30	103181 - 103210	January 18, 1973
		TOTAL 40 CLAIMS

D. A. CHAPMAN & ASSOCIATES LTD.

3513 W. 31st Avenue, Vancouver 8, B. C.

November, 1972

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November, 1972

Attention: Mr. G. C. Gutrath, P.Eng.,
#420 - 475 Howe Street,
Vancouver 1, B. C.

Dear Sir,

At your request I have completed a Tectonic Survey from aerial photographs of the "AT" Claim Group, for the At-Ex Group Exploration Project, in the Kamloops Area, Kamloops Mining Division, British Columbia.

PROPERTIES

The owner of the claims is Delta International Minerals Ltd., the names and record numbers are as follows:

Name of Claim	Record Number	Expiry Date
EX 9	103163	January 18, 1973
EX 11	103165	January 18, 1973
EX 19	103173	January 18, 1973
EX 20	103174	January 18, 1973
EX 21	103175	January 18, 1973
EX 22	103176	January 18, 1973
EX 23	103177	January 18, 1973
EX 24	103178	January 18, 1973
EX 25	103179	January 18, 1973
EX 26	193180	January 18, 1973
AT 1-30	103181-10320	January 18, 1973
		TOTAL 40 CLAIMS

LOCATION AND ACCESS

The property lies to the west of Cherry Creek and on the eastern slope of Greenstone Mountain, at an elevation of approximately 4,000 feet A.S.L.. It is approximately 4 miles southwest of the Afton orebody at Pothole Lake in the Kamloops Area of B. C.

It is accessible by dirt road along the west bank of Cherry Creek. The distance from the N°. 1 B.C. Highway and the Cherry Creek Junction is about 3 1/2 miles.

REGIONAL GEOLOGY

The claims are underlain by Nicola Rocks of andesites, tuffs and related volcanics of upper triassic age. Plugs of the Coast Intrusions have been mapped on Greenstone Mountain. The closest mapped plug to the claims outcrops on the eastern slope at about 5,000 feet, and to the west of the claims about one mile distant.

TECTONIC SURVEY RESULTS

Three maps of the programmed results have been produced for the report as follows:

Plate N°. 1 - An isogram of the stress normal to the horizontal surface produced by Young's Modulus Effect.

Plate N°. 2 - An isogram of the stress parallel to the surface produced by the anisotropic effect of the strain or Poisson's Effect and showing the tensile fault system of preferred vertical fault planes indicated by the "O" isogradient.

Plate N°. 3 - A tectonic map showing the surface areas where the minimal differences of the two stress effects above would indicate an unrestrained shearing force or rotational stress was probable to produce zones of maximum density tension fracture voids.

COMMENTS AND RECOMMENDATIONS FOR PROSPECTING

The Tectonic Map (Plate 3) shows the most probable areas within the claims where mineralization and host rock preparation are likely to be found at surface. It is an objective decision based on the logic of Mohr and Rock Mechanics, and except for the coeffecient of unrestrained shearing force, gives no other preference to the zone indicated for prospecting. As potential traps for mineralization at or near surface they are the first zones for prospecting priority.

The core of the zone is indicated by cross hachuring and diminishes either to depth from surface or in lateral extent as a result of the interplay of tangential and normal stresses acting across potential fracture interfaces, thus a limit to the areal extent for prospecting traverses is indicated by the dash line of the lower coefficient isogradient.

The importance of one tectonic zone relative to another cannot be given a priority, since only field prospecting or additional geological, geochemical and geophysical information would indicate a priority.

Each zone should be examined by prospecting, or if other information is available should be correlated for significance.

The Anisotropic Map (Plate 2) shows the probable fault zones of preferred vertical shear planes resulting from the relief of the primary stress load applied to the semi-infinite elastic solid of the crustal block examined. It is an objective decision determined by the "O" isogradient and is based on the theories of the behaviour of rock materials under stress. A degree of lateral extension across these *vertical planes offer the shortest route and the minimum resistance to penetration from below by intrusions and/or mineralizers, as such they are the most probable channels for ascending or transcending mineralization.*

These deep seated fissure zones can themselves be a possible ore host structure, but in many instances will be surface tension cracks created by the unloading strain in the rock. There is no particular way to determine the deep seated ruptures from the shallower surface zones except by field examination and geophysical probing. Perhaps the extent or length may be an indication of the depth to the fissure and therefore the lengthier structures should be traversed in the field, and in particular where they extend into a tectonic zone, regardless of length.

The Pressure Function or T_{max} *Map (Plate 1) shows the effect of the primary loading stresses within each cylinderical rock column relative one to the other. The isogradient reflects the flow potential of the stress wave front during the primary load and as a dispersion gradient during this thermodynamic action gives some indication of the geothermal gradient. If this is true, the flow of mineralization would be up the gradient to the zone of lowest equipotential, i.e., the tectonic zone at surface.*

The last two maps are provided for geological and geophysical correlations of existing or future data obtained in the area, whereas the Tectonic Map is the essential field guide for prospecting the area efficiently and economically.

It is felt the Tectonic Map is self explanatory with regard to it's use in the field and is essentially of a geological nature which requires field validation for economic significance. The results of evaluation and/or correlation by the field engineer will determine the recommendations for future work programs.

CONCLUSION

In terms of economic prospecting, the area of initial interest within the claims have been reduced to about a quarter of the overall claim area. This ground should be slowly and carefully traversed for any possible mineral outcrop.

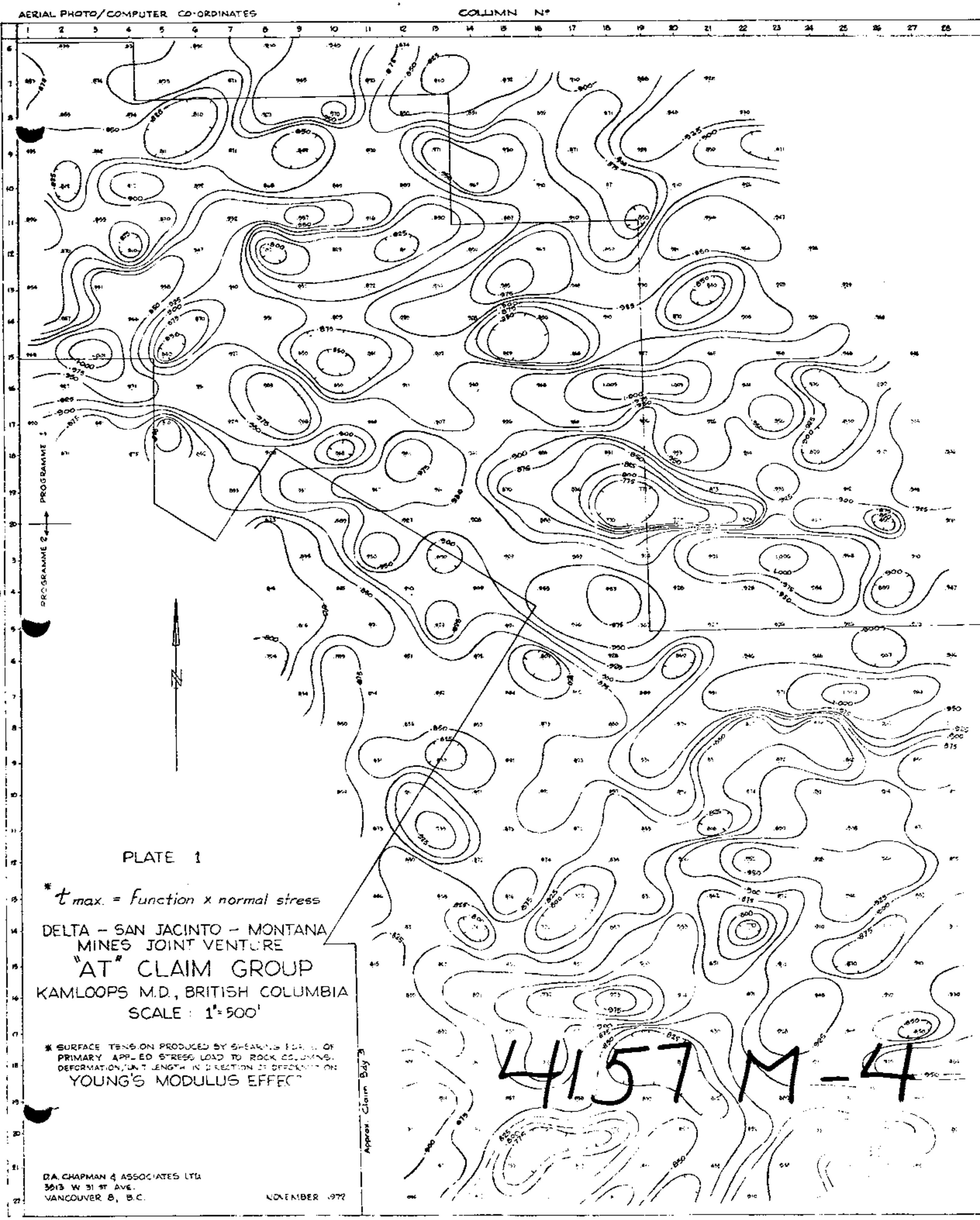
The following prospecting procedure is recommended:

1. *A zigzag traverse should be walked out across the breadth and along the length of each zone with careful attention paid to any geological outcropping for evidence of mineralization or alteration. Chip samples should be marked and flagged and then noted to the map print for use in rock geochemistry if required.*
2. *Where possible, soil samples at regular intervals should be collected and noted for location along the traverse.*
3. *A reconnaissance magnetometer should be carried over the traversed area to detect any possible kicks indicative of a geophysical anomaly.*
4. *Where positive information is obtained the zone indicated by the Tectonic Map should be gridded for detailed geophysical work.*
5. *If warranted, drill test the core of the target zone.*

If adhered to, the above program will be inexpensive and is the most probable evaluation of the economic potential within the claims area. It does not eliminate the possibility of an ore zone at depth within the vertical fault zones and for that reason the strike of these *faults should be walked out...unless evidence of mineralization is visually found along these strikes, further prospecting at the increased costs is seldom warranted.*

Respectfully submitted,

D. A. Chapman & Associates Ltd.


AERIAL PHOTO/COMPUTER CO-ORDINATES
COLUMN Nº
PROGRAMME 1
PROGRAMME 2
PLATE 1
* $t_{max.}$ = function x normal stress
DELTA – SAN JACINTO – MONTANA
MINES JOINT VENTURE
"AT" CLAIM GROUP
KAMLOOPS M.D., BRITISH COLUMBIA
SCALE : 1"=500'
YOUNG'S MODULUS EFFECT
Approx. Claim Bdy
D.A. CHAPMAN & ASSOCIATES LTD.
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VANCOUVER 8, B.C.
NOVEMBER 1972
4157 M-4

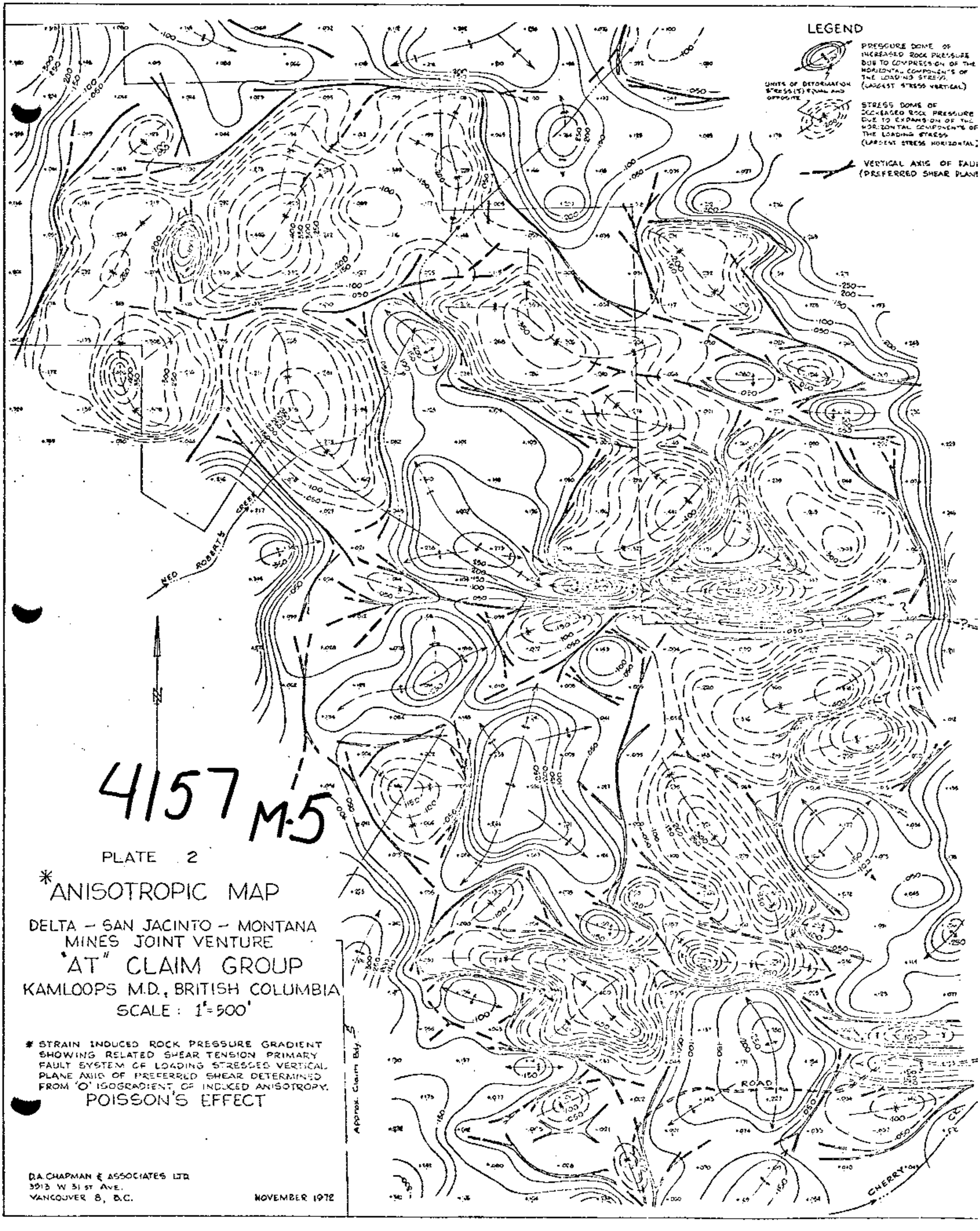

PLATE 2

*ANISOTROPIC MAP

DELTA – SAN JACINTO – MONTANA MINES JOINT VENTURE

"AT" CLAIM GROUP

KAMLOOPS M.D., BRITISH COLUMBIA

SCALE : 1"=500'

* STRAIN INDUCED ROCK PRESSURE GRADIENT SHOWING RELATED SHEAR TENSION PRIMARY FAULT SYSTEM OF LOADING STRESSED VERTICAL PLANE AXIS OF PREFERRED SHEAR DETERMINED FROM 'O' ISOGRADIENT OF INDUCED ANISOTROPY.

POISSON'S EFFECT

D.A. CHAPMAN & ASSOCIATES LTD
3913 W 31 st AVE.
VANCOUVER 8, B.C.

NOVEMBER 1972


ISOMAGNETIC - TECTONIC CORRELATION
to accompany tectonic analysis report of Nov. 72
7900
7800
7700
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TECTONIC MAP
4157 M-6
CLAIM GROUP

Department of
Mines and Petroleum Resources
ASSESSMENT REPORT
NO. 4157 MAP #6

Addendum - G. C. Gutrath, P.Eng.

This report is intended to assist in the field exploration of the claims studied. The isogradients are useful for the ground prospecting and the correlation of airborne geophysical surveys. The tectonic structural targets are zones of faulting which offer potential traps for mineralization. If present, mineralizers would more likely take advantage of areas of increased fracturing or deformation, thus focusing attention to those areas of greater deformation should reduce exploration costs.

I have personally collaborated and discussed the material contained herein with the author, D. A. Chapman.

Signed this day of November *1972*

PROFESSIONAL ENGINEER
PROVINCE OF BRITISH COLUMBIA
G. C. GUTRATH

G. C. Gutrath, P.Eng.

CERTIFICATION

1. *I, Douglas A. Chapman, certify that I have practised the art of photogeological interpretation for mineral exploration for more than 15 years.*
2. *I received a Technical Diploma in 1949 from the Vancouver Technical School.*
3. *From 1950 to 1955 I was engaged in mapping and surveys using both ground and airborne methods; first, with the Canadian Government and, secondly, with Photographic Surveys (Western) Ltd. in Vancouver.*
4. *From 1955 to 1959 I was engaged by Blanchet and Associates Ltd. in Calgary, Alberta, where I practised interpretation and compilation of fracture patterns for structural studies related to oil exploration.*
5. *From 1961 to 1964 I was engaged by Chapman, Wood and Griswold Ltd. and assisted Mr. Blanchet in the formation of their air photo department as well as carrying out studies relating to tectonics and their association to mineral deposits.*
6. *In 1965 I formed D. A. Chapman & Associates Ltd. to provide air photo interpretation for mining exploration and, primarily, exploration reports to assist consulting engineers in planning field programmes.*

Signed this 10th day of January, A.D. 1973.

D A Chapman

D. A. Chapman,

D. A. Chapman & Associates Ltd.

ADDENDUM:

THEORY OF TECTONIC ANALYSIS

Tectonic analysis of the unit area density of visible lineal features apparent in aerial photographs is a programmed computer analysis which uses as it's basic empiric input the estimated count of interpreted fracture/joints within a circular sample area of unit size, taken at consistent grid intervals over the horizontal surface covered by the aerial photograph.

The phenomena which makes visible these lineal features is the surface tension forces acting as horizontal components of the unloading stresses existing within the earth's crust. This surface tension, relative from point to point observed, will vary due to the pressure differential of the underlying rock column that is the unloading force.

The changes in pressure load result from relief of the primary load inherent in the formation and evolution of the underlying crustal block examined. The mechanical effects of the forces produced, may produce changes in volume and shape; finally, fracture or flow may result from the stress load relief.

The basis for tectonic analysis is Rock Mechanics, which is the study of the effects of forces on rocks. The principal effects of interest to the geologist and geophysicist are the changes in shape and the dynamic aspects of changes in volume and shape. In mineral exploration its usefulness would apply to the tectonic phenomena influencing the predictability of fracture, and with the changes in volume or shape of rocks such as shear zones, dykes or folded complexes.

The subject of rock mechanics involves:

1. *the analysis of loads or forces applied to the rocks (primary load).*
2. *the analysis of the internal effects in terms of either stress, strain or stored energy.*
3. *the analysis of the consequences of these internal effects or deformation of the rock.*

The principal axioms of tectonic analysis are:

1. *the earth's crust is a physical boundary for the mechanical forces within.*
2. *as a physical boundary a condition of equilibrium stress exists for the vertical and horizontal forces.*
3. *the surface plane viewed is a semi-infinite elastic solid consisting of an infinite series of vertical parallel and adjacent cylinderical rock columns.*
4. *by empiric substitution and analogy the mechanical formula of rock mechanics can be applied.*

The surface tension curve is similar to the enveloping curve of Mohr or, t_{max} = function x normal stress and is in part a measurement of the ability of the rock to resist shearing stresses.

An isogram resembling this curve is produced from the empiric using the theoretical logic of Mohr to determine coefficients of the normal stress acting on the vertical planes within the area surveyed.

A second isogram uses the variance observed at a point for the observed density empiric and equates this relationship to the ratio of the axiis of the circular sample area to the elliptical axiis that would be produced by the deformation of the horizontal forces acting through the apex of the theoretical cylinderical rock column.

In the former we produce a three dimensional surface of Young's Modulus Effect of Deformation, i.e., the absolute or relative movement of a point on a body or, the change in a linear dimension.

In the latter isogram we produce a three dimensional surface of Poisson's Effect, i.e., the lateral deformation resulting from the longitudinal stress.

The first isogram is the product of the normal stress; the component of stress normal or perpendicular to the plane on which it is acting. The isogradient is the normal strain or deformation per unit length in the direction of deformation, which in the case of a semi-infinite elastic solid, i.e., the crustal block, the deformation is a change in pressure only.

The second isogram is the product of the shear stress; the component of stress tangential or parallel to the plane on which it is acting. The isogradient produced is the shear strain or the deformation per unit length, where the length over which deformation occurs is at right angles to the direction of deformation. This is the anisotropy induced at the surface boundary of a semi-infinite elastic solid by the change in tangential stress.

Stress is considered to be the internal force per unit area when the area approaches zero, and pressure is reserved for the external normal force per unit area, <u>even though the pressure at the boundary will equal the normal stress in the material at that point</u>.

A final isogram that is a <u>two dimensional plan surface</u> for prospecting indicates the surface zones where the defferential of normal and *shear stress indicate a minimal resistance to shearing forces is inherent in the underlying rock according to the logic of Mohr. These zones of lateral extent have the maximum fracture voids available relative to the deep seated vertical planes of preferred shear.*

As such the areas indicated by the isogram are the most probable zones for surface prospecting in terms of fracture voids available, and possible fracture flooding due to stress of dyking intrusion or attendant hydrothermal emanation of mineralizers.

INTERPRETATION OF SURFACE EFFECTS AND COMPILATION TECHNIQUES

A stereo pair of vertical aerial photographs is used to annotate to a clear transparency overlay, the most apparent tension joints of the fault/fracture systems visible.

Linears or isostatic traces linking these systems are drawn by projection of the physical geographic features along the line of tension, such as drainage and soil leaching, foliage and preferred growth or non-growth, etc. Projection of the trace is aided by the fact that vertical planes only are sought by the interpreter and therefore, regardless of topography straight line projection is possible and most probable. These systems geometrically relate to the directions of principal stress of the unloading forces inherent within the crustal block.

The annotated overlay completed consists of a multitude of linear traces, in differing directions and in conjugate sets. The density in any unit area will vary in proportion to the degree of surface tension exerted as planar strain across the vertical interfaces of the fault/fracture systems observed.

Propogation of these systems through overburden is a continuous process of earth tidal movements acting across the interfaces. Much less visibly dramatic as oceanic tides, but a measureable and continuous relative movement is present as a result of the same geophysical forces. These movements are to some degree amplified in unconsolidated overburden in a similar manner and for similar reasons as the wave motion at the surface of the ocean is an amplification of the ground swell generated by the tidal flow. This is an essential concept to interpretation of the isostatic traces which allows a consistency to interpretation. Suffice it to say without prolonged argument that overburden is present throughout all the model areas surveyed to date and the results of tectonic analysis have not been encumbered by the effects of overburden masking to the extent that ground level geophysical and geological surveys have.

The number of intercepts of the traces are counted as an estimate of the density empiric within the confines of a designated unit area size by placing the overlay over a template of interlocking coalescing circular sample areas. By recording the number of trace intersections with the periphery of each circle, a consistent empiric value for each sample area is obtained for the initial computer input.

The design of the sampling method is such that it is possible to measure differences from background for each unit sample area to effectively filter vertical topographic differences as well as basic rock moduli due to lateral rock types.

The sampling technique becomes a mechanical filter which determines the sample variance from the average variance of it's immediate underlying background variance. The mean of the differences is independent of relief and modulii when measured against the average of the sum of the background differences. The resulting profile line is similar to the electronic clipping of a carrier signal wave; or mathematically similar to a Fourier Analysis.

Respectfully submitted,

D. A. Chapman,
D. A. Chapman & Associates Ltd.

CORRELATION OF AIRBORNE ISOMAGNETIC SURVEY

and

TECTONIC ANALYSIS

To accompany report by: D. A. Chapman & Associates Ltd. November, 1972.

INTRODUCTION

An Airborne Isomagnetic Survey Report by Sandner Associates was compiled from airborne data acquired from a previous survey of the Afton-Kamloops Area, for this report on the "AT" Claims ten gamma readings were extracted from flight line profile mag tapes.

It should be made emphatically clear to the reader that the sole purpose of the correlation is to define magnetic confirmation of tectonic structure and is not intended to infer anomalous magnetic bodies or any economic mineral associations.

In terms of overall magnetic relief of the "total field" magnetic gradient, a difference of 400 gammas is maximum and the relief is easily termed "shallow", within a mean isomagnetic background of approximately 57,700 gammas. This relatively high magnetic datum plane is indicative of the greenstones and meta-volcanics of the Nicola Series which underlie the claim area surveyed.

When taken to ten gamma readings the resultant isogradient shows considerable field reversal patterns indicative of the shearing stresses acting throughout the area.

OBSERVATIONS AND CONCLUSIONS

Five target areas for exploration are indicated and magnetically confirmed by coincidence of the isogradients from each survey. They are listed below along with their possible significance.

Target A - A magnetic high situated over a tectonic zone may indicate the presence of an underlying plug or mafic dyke. The Tectonic Map indicates a high probability of a breccia zone. The increased magnetic field may be associated with mineralization and the target should be examined by geochemistry if no visible evidence is available on the ground.

Target B-B, - The directional change in the field would confirm the presence of the strong northerly shear fault indicated by the Tectonic Map. The northern half of the fault lies outside the claims but the southern half O-B, junctures just within the claims and extends about 5,000 feet to the south. It is possible the fault dips slightly west and plunges to the south.

Target C - This target is a magnetic low enclosure that centers on a possible breccia column indicated by the tectonic analysis. The magnetic configuration may be reflecting an intrusive plug at depth or a very acidic rock type at near surface. The western flank has a surface zone which may expose either breccia or intrusive at the surface. The target area may be a very important structure and should be gridded for geophysical and geochemical surveys if the geology of the area supports the supposition. A lot would depend on the field readings of the vertical magnetic component. Strong magnetic anomalies should flank the target in the field or a very strong magnetic anomaly over the apex, depending on the depth of the distrubance.

Target D - Very similar to Target A.. possibly a mafic dyke or breccia zone.

Target WOW, - The target is the intersection of two shear faults which are well confirmed by both surveys. A great deal of rotational stress is indicated by the tectonic survey so the fracturing of the rock would be quite extensive. The area warrants intensive prospecting along both the eastwest and northsouth strikes since it is most probable that if mineralization is present in the area, there will be evidence found within these shear zones.

To conclude, the surveys are independent surveys carried out by two differing methods and companies. The isomagnetic field is susceptible to the changes in rock modulii induced in the underlying crustal block by the deformation stress. In an area of low magnetic relief the ten gamma contour interval has an extremely good correlation of the shear response of the magnetometer to the indicated zones of shear by tectonic analysis.

It suggests that more sophisticated correlations may be possible from the magnetic data. It is certain both surveys are sensitive to any changes in deformation stress.

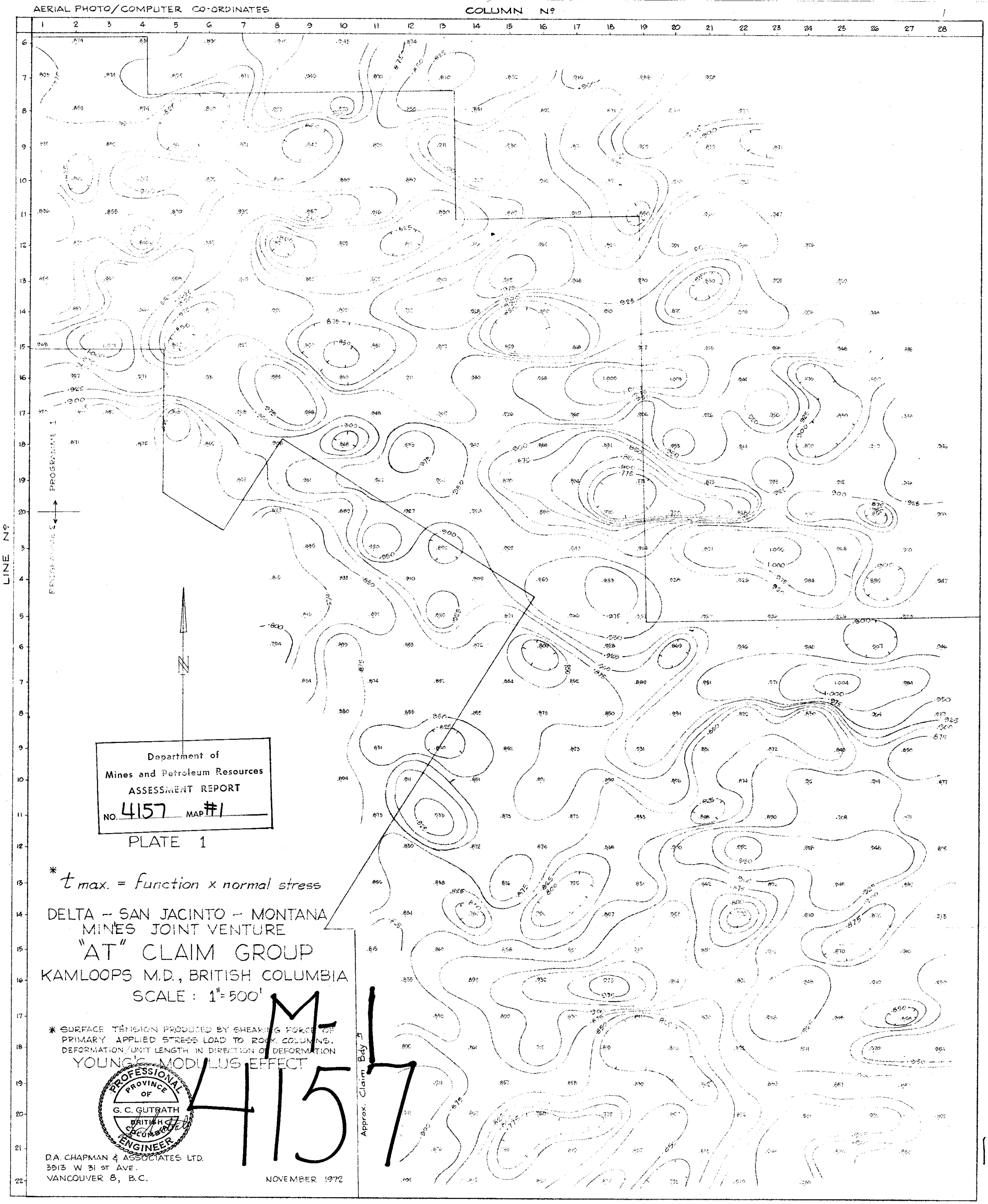
The area of highest priority for future prospecting is along the two fault structures confirmed by both surveys. The tectonic survey says that shearing and brecciation at surface has occurred. The zones of maximum density fracture voids contained within these faults are the most probable areas foran economic orebody to be found.

To date no mineralization has been reported on the property nor has any extensive ground prospecting program been carried out. The report is intended as a evaluation of the property and as a guide for an efficient prospecting programme.

Respectfully submitted,

D. A. Chapman,
D. A. Chapman & Associates Ltd.

APPENDIX



AERIAL PHOTO/COMPUTER CO-ORDINATES
COLUMN Nº
LINE Nº
Department of Mines and Petroleum Resources ASSESSMENT REPORT NO. 4157 MAP #1
PLATE 1
* t max. = function x normal stress
DELTA – SAN JACINTO – MONTANA MINES JOINT VENTURE
"AT" CLAIM GROUP
KAMLOOPS M.D., BRITISH COLUMBIA
SCALE : 1" = 500'
* SURFACE TENSION PRODUCED BY SHEARING FORCE OF PRIMARY APPLIED STRESS LOAD TO ROCK COLUMNS. DEFORMATION/UNIT LENGTH IN DIRECTION OF DEFORMATION
YOUNG'S MODULUS EFFECT
PROFESSIONAL ENGINEER PROVINCE OF BRITISH COLUMBIA G. C. GUTRATH
D.A. CHAPMAN & ASSOCIATES LTD.
3913 W 31 ST AVE.
VANCOUVER 8, B.C.
NOVEMBER 1972
M-1
4157
Approx. Claim Bdy
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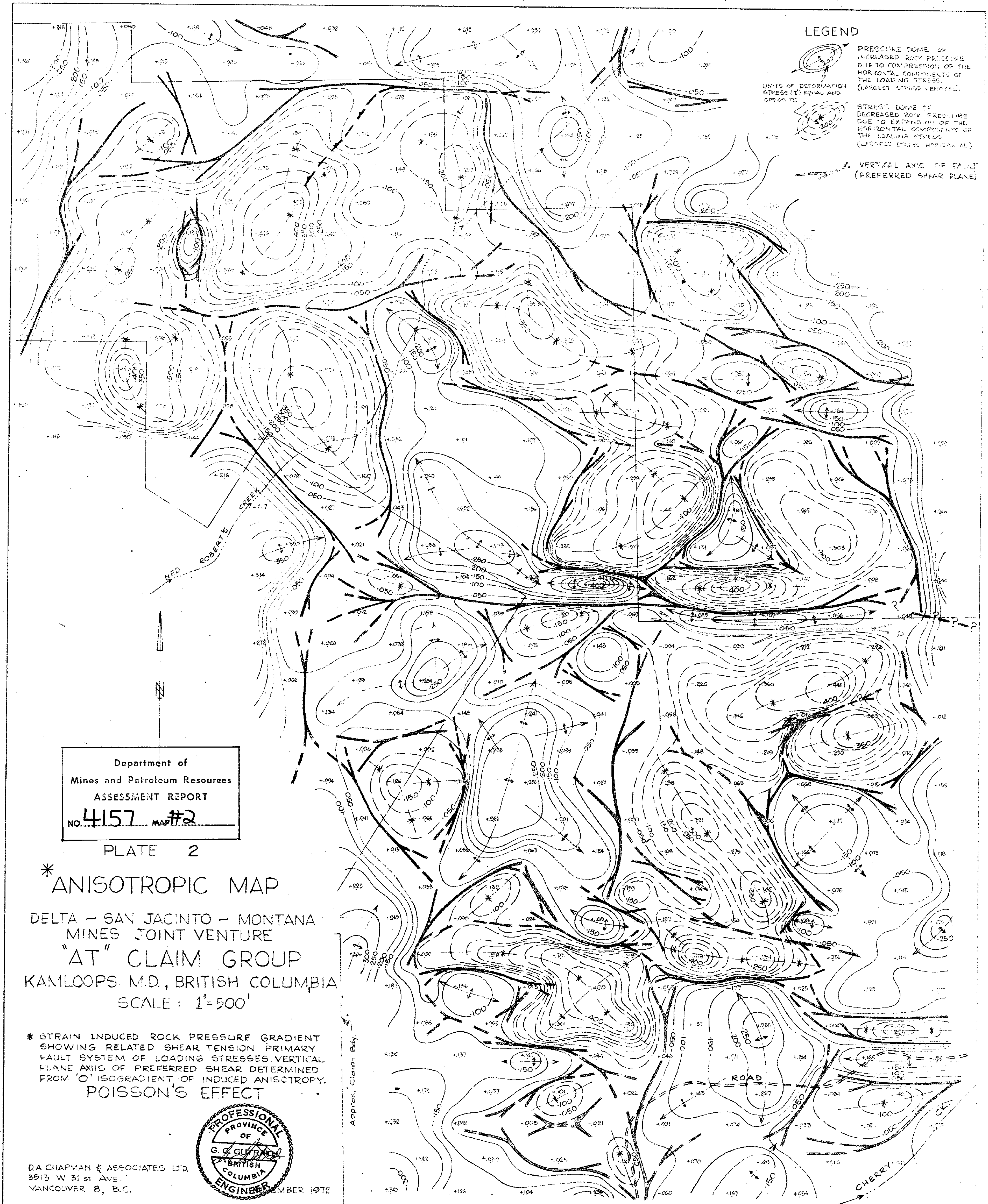
LEGEND
PRESSURE DOME OF INCREASED ROCK PRESSURE DUE TO COMPRESSION OF THE HORIZONTAL COMPONENTS OF THE LOADING STRESS. (LARGEST STRESS VERTICAL)
UNITS OF DEFORMATION STRESS (%) EQUAL AND OPPOSITE
STRESS DOME OF DECREASED ROCK PRESSURE DUE TO EXPANSION OF THE HORIZONTAL COMPONENTS OF THE LOADING STRESS (LARGEST STRESS HORIZONTAL)
VERTICAL AXIS OF FAULT (PREFERRED SHEAR PLANE)
NED ROBERTS CREEK
N
ROAD
CHERRY CK.
Approx. Claim Bdy.
Department of Mines and Petroleum Resources
ASSESSMENT REPORT
NO. 4157 MAP #2
PLATE 2
*ANISOTROPIC MAP
DELTA – SAN JACINTO – MONTANA MINES JOINT VENTURE
"AT" CLAIM GROUP
KAMLOOPS M.D., BRITISH COLUMBIA
SCALE: 1"=500'
* STRAIN INDUCED ROCK PRESSURE GRADIENT SHOWING RELATED SHEAR TENSION PRIMARY FAULT SYSTEM OF LOADING STRESSES. VERTICAL PLANE AXIS OF PREFERRED SHEAR DETERMINED FROM "O" ISOGRADIENT OF INDUCED ANISOTROPY. POISSON'S EFFECT
PROFESSIONAL ENGINEER
PROVINCE OF BRITISH COLUMBIA
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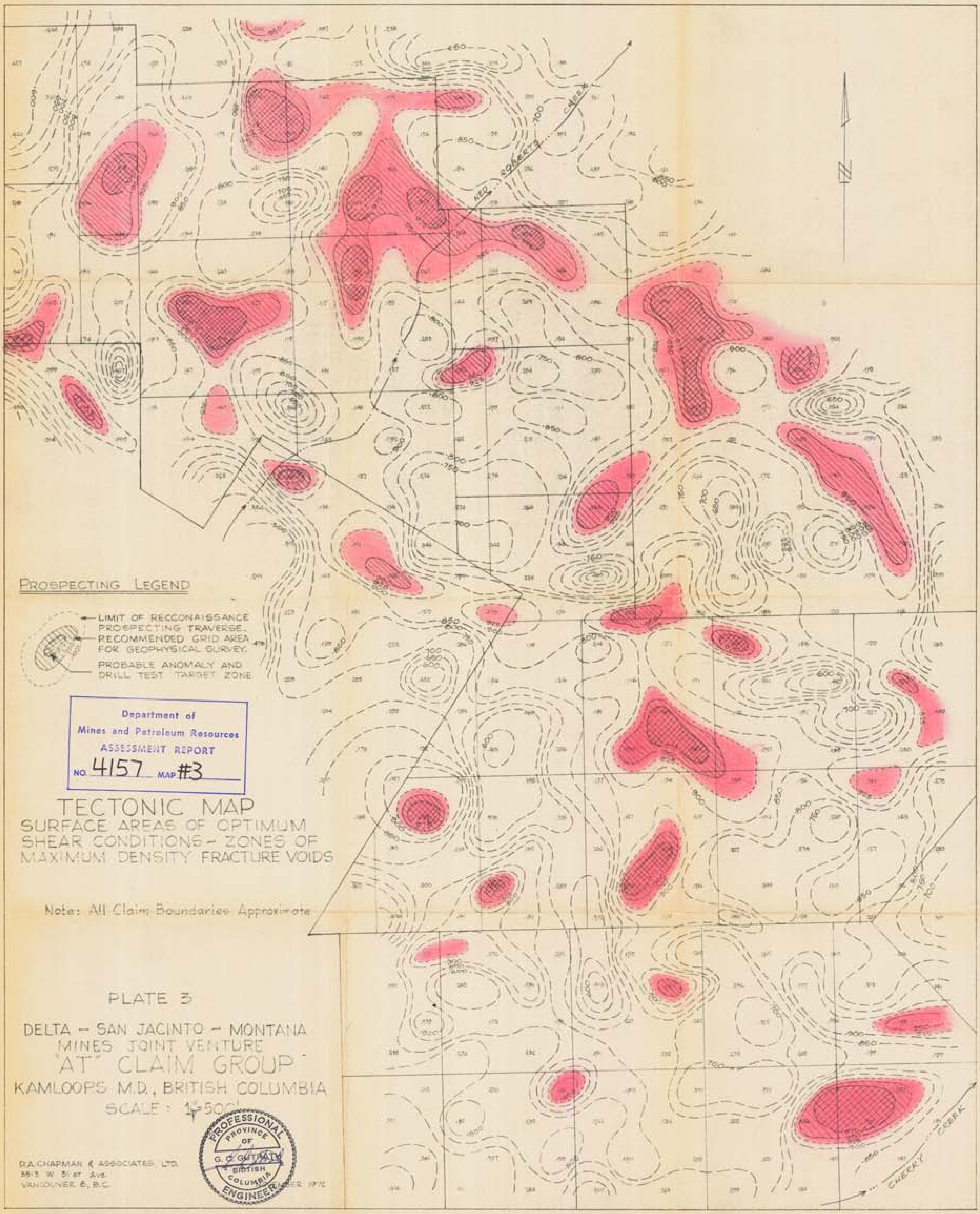

PROSPECTING LEGEND
LIMIT OF RECCONAISSANCE PROSPECTING TRAVERSE.
RECOMMENDED GRID AREA FOR GEOPHYSICAL SURVEY.
PROBABLE ANOMALY AND DRILL TEST TARGET ZONE
Department of Mines and Petroleum Resources
ASSESSMENT REPORT
NO. 4157 MAP #3
TECTONIC MAP
SURFACE AREAS OF OPTIMUM SHEAR CONDITIONS - ZONES OF MAXIMUM DENSITY FRACTURE VOIDS
Note: All Claim Boundaries Approximate
PLATE 3
DELTA - SAN JACINTO - MONTANA
MINES JOINT VENTURE
"AT" CLAIM GROUP
KAMLOOPS M.D., BRITISH COLUMBIA
SCALE: 1"=500'
D.A. CHAPMAN & ASSOCIATES LTD.
VANCOUVER 8, B.C.
PROFESSIONAL ENGINEER
PROVINCE OF BRITISH COLUMBIA
NED ROBERTS CREEK
CHERRY CREEK
N