A STRATEGY OF STRUCTURAL ANALYSIS

FOR

SURF INLET MINES LTD.

BY

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GEOLOGICAL ENGINEER

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for
SURF INLET MINES LTD.

RECOMMENDATIONS:

I recommend a staged program of analysis:

1. BASED ON EXISTING DATA
   - 1.1 Regional Analysis
   - 1.2 Vein and Shear Graphic Analysis
     - 1.2.1 Contoured maps of the fault system
     - 1.2.2 Isopach maps of vein thickness
     - 1.2.3 Cummulative Gold (Ag & Cu) Assay Maps
     - 1.2.4 Correlation of the above
   - 1.3 Shear Movement Analysis
     - 1.3.1 Shear morphology and fit
     - 1.3.2 Branching analysis
   - 1.4 Stereo Projection Analysis

2. BASED ON FUTURE STUDIES
   - 2.1 Confirmation of vital data in reports
     - 2.1.1 Nature of the mine fault system
     - 2.1.2 Nature of the vein mineralization
   - 2.2 Systematic data gathering and analysis
     - 2.2.1 Classification of veins by morphology and mineralization
     - 2.2.2 Analysis similar to Stage 1
   - 2.3 Research
     - 2.3.1 Chronology of geological and structural events
     - 2.3.2 Relationship between the gneiss belt, the fault zone and the ore
     - 2.3.3 Nature and origin of the ore fluids

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GENERAL STATEMENT:

Not much progress has been made for 30 years in developing genetic models for mesothermal vein deposits although most other types of deposits have had startling advances in recent years. Structural control of dilatancy is still accepted as the principal factor in ore desposition and hence its investigation is the principal tool in exploration. It is equally important to relate the chronology of events and the geochemistry (assay distribution) to the existing structures so that those vital in ore deposition can be distinguished and also to build confidence that in fact these structures have resulted in ore deposition.

Voluminous data exist for the Surf Inlet and Pugsley mines and the mine shear but little is focussed toward structural analysis - e.g. there are no plots of mullions or slickensides, and no vein maps that distinguish the reported two generations of mineralization. This leaves fault attitudes, vein widths and development assays as the principal information useful in structural analysis from existing data. Statements of structural importance occur in many reports that need to be checked and amplified. The features of vein morphology and orientations, multiple mineralization, shear movement, slickensides and mullions are mentioned but none of these appear to be plotted, especially not on a systematic basis. It seems clear that the main fault system is a brittle shear so that diletancy is related to morphology and movement vectors. Finally the chronology of the structural events is poorly known.

GENERAL STATEMENT (Cont'd)

Clearly the strategy for structural analysis will have to be a staged one:

STAGE 1 - working with available data, develop a preliminary structural model, strain analysis and movement picture. A fair amount of experimentation and program development will be necessary to develop the best method of portraying and analysing the data.

STAGE 2 - institute a mapping program integral to exploration to develop precise structural data for statistical analysis and correlation with assay data. This can be augmented by a modest level of research to establish the chronology of structural development and ore deposition and possibly sources of fluids.

On the basis of existing data the model that needs to be tested is that:

(1) the mine shear is tributary to the Greville Channel Fault Zone where this flexes toward the Pacific in a southerly direction.

(2) the shear is actually a thrust in which the hanging wall moved upward and southerly.

(3) the trace of the fault zone is convex to the west with the attitude in the south (Pugsley) being more westerly, and in the north (Surf Inlet) more easterly than in the northerly striking connection in the valley.

GENERAL STATEMENT (Cont'd)

(4) dilatancy and vein splaying resulted on both flanks of the bearing surface represented by the shear plane between the two mines.

(5) the same dilatancy should extend to depth.

(6) other deflections from the northerly strike of the system will also contain steeply raking dilatant features, veins and ore.

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STAGE 1 - ANALYSIS OF EXISTING DATA

1.1 Regional Analysis should be carried out from GSC maps to determine the important regional factors, strain movement vectors, chronology of events related to the mine shear and mineralization. Preliminary analysis shows some useful concepts may be developed relative to the model of ore development, regional prospecting, and as background for promotion.

1.2 Vein and Shear Graphic Analysis

1.2.1 Contoured maps of the fault system - develop a contoured map in the average plane of the fault system (Conolly diagram), hanging wall and footwall separately. Data is probably only dense enough in the two mines, but it is probably important to have these related to a common plane and exploration drifts, surface and drill intersections may provide sufficient connection.

Analysis 1.4 may show that the mines cannot be combined in which case a small scale overall trace is desirable.

1.2.2 Isopach maps of vein thickness - cummulative vein thickness of known veins should be plotted in the selected plane of the vein for comparison with contoured fault maps. Some problems of projection from horizontal drifts onto the plane of the vein will have to be resolved - data probably only sufficient in the mines.

STAGE 1 - ANALYSIS OF EXISTING DATA (Cont'd)

1.2.3 Cummulative Gold Assay Maps - cummulative gold (Ag & Cu) should be plotted on the selected plane of the fault, either hanging or footwall. Projection of assays of development drifts may have to be projected horizontally on to either hanging or footwall and a contoured map developed for each mine. If the assays are very erratic some generalizing or smoothing procedure will be necessary, e.g. - average of 5 analyses.

1.2.4 Correlation of Fault System, Vein Thickness and Assays - correlation of these three data sets may best be done visually by transparent overlays but a statistical or computer method could be developed. Hopefully this analysis will give fairly rigorous trends in the known vein system but unfortunately it does not 'know' anything about potential much beyond the mines except projections from known structures or ore.

1.3 <u>Shear Movement Analysis</u>

1.3.1 Shear Morphology - the best fit of hanging wall and footwall can be developed using the extended mines and shear plot of attitudes. The model of hanging wall up and right, i.e. oblique thrust, could be tested.

1.3.2 Branching Analysis - probably best done visually using vectors of acute angles of shear intersections for closing direction. Possible importance is that it may indicate reduction of shears with depth or not, i.e. restriction of the plumbing. It also helps in analysis of dilatancy.

1.4 Stereo Projection

1.4.1 Stereo projections can be used to check data of graphic analysis and also to give simple cummulative and statistical visualization of structures. Shear attitudes by sector etc. should be plotted and would graphically demonstrate the similarity or differences between Surf, Pugsley and connecting shears.

STAGE 2 - FUTURE FIELD AND MINE STUDIES AND ANALYSIS

Principal studies should be phased in with the exploration program with its priorities set by a combination of cost, importance and logistics.

2.1 Confirmation of the Vital Data contained in Previous Reports - many reports make statements that cannot be confirmed from existing maps. These should be checked as quickly as possible.

2.1.1 Nature of the mine fault system - is it a shear, a thrust, nature of movement? Is it a late intrusive feature as stated or not?

2.1.2 Nature of vein mineralization - two periods of vein mineralization are mentioned with gold deposition attributed to the later (minor) mineralization. Is this true? How are they distinguished? What is the relation and distribution of the 2nd stage to the 1st if it is? How are they related to morphology of shear and veins?

2.2 Systematic Data Gathering, Mapping and Analysis

2.2.1 Classification of veins by morphology and mineralization - i.e. shape, brecciated nature, sheeting, mineralogical distribution, orientation, textures, open space filling or replacement, relative age. This will have significance in recognizing the

STAGE 2 - FUTURE FIELD AND MINE STUDIES AND ANALYSIS (Cont'd)

true movement vectors, distribution of ore and potential new ore shoots.

2.2.2 New data should be analysed as in Stage 1 with more confidence.

2.3 Research - if serendipidy and good exploration lead to significant development of new ore, three fields of research could be productive: (i) chronology of events by dating (ii) investigation of the relationship between the gneiss belt, the shear and ore (iii) origin of the ore fluids and potential extension to depth.

2.3.1 The chronology of events is truly important and is not firmly established. Its precision could be easily upgraded at modest cost by dating mineralization by sericite hopefully in both (all?) vein stages and wall rocks; by dating the undeformed (?) crosscutting diabase and other dykes; by dating each intrusive phase relatively close to the mine, i.e. the Butedale granodiorite, the Princess Royal quartz diorite, and the mine gneiss inlier.

2.3.2 Investigate the relationship between the gneiss belt (inlier?), the fault, and the ore. Is the gneiss a ductile phase of deformation that led to brittle fracture on uplift? Or is the fault system entirely related to the Grenville Channel Fault zone?

Is the restriction of known ore to the fault zone structural or geochemical? Important to know this for any extension of prospecting along the zone or elsewhere in the Coast Mountains.

2.3.3 Nature and origin of the ore fluids - study by oxygen isotopes, geothermometry and other methods could relate the ore to a source fluid - i.e. deeply circulating surface water, magmatic, metamorphic. This could have importance to possibility of extension of ore to depth and general prospecting in the Coast Range.

APPENDIX 1

ANALYSIS OF COST

Only crude estimates can be made on some programs as computer costs are largely unknown to me. Program development for Stage 1 - 1.2.1 to 1.2.3 might be significant but most of the data is loaded. Compared to drilling, geophysics, dewatering the mine, the costs are minimal. Many of the man days will involve present staff and so need not necessarily represent additional costs.

STAGE 1 -	1.1	2 days	$ 900.00
	1.2	22 "	8,900.00
	1.3	3 "	1,400.00
	1.4	3 "	1,200.00
STAGE 2		Field work that might not have been done during regular exploration program	15,000.00
		Computer costs of new runs and data entry	5,000.00
	2.3.1	Support of PhD student in field work	6,000.00
		Laboratory analysis and/or student time	3,000.00
	2.3.2	Additional fieldwork	5,000.00
	2.3.3	Ore fluid research	5,000.00
		TOTAL	$51,400.00