

Mon. Dec. 3/84

TULSEQUAH-CHIEF

NWMA-Spokane

889006
104K/12E
104K 002

- Paul Sobara
- Possibly joint venture agreement with U.S. Borax (American)
- u/g accessible just above 'Main' level.
- all core just above 'Main' level
- still good potential here!

BIG BULL

- Core burned in 1980!

→ talk with Roger George (US BORAX)
- good deal offered by Cominco but
"logistics" not good (i.e. price of metals + access)

WEDGEWOOD

HOTEL

AGM - CIM
(Van.)
Apr. '85

John Payne +
Joanne Nelson

Tul. Chief

- altd rhy. - strongly folded
- discontinuity, late
- felsic 'centre'

Big Bull

- gtz-ser schist + tuffaceous rx,
- top towards west?



ERICKSEN-ASTBY

- ms. - rhyolite between
- 1st + volc. - sub. in rhy.
- possible 'centre'

- rhodamite-rich stam. - Xcids bedding.
- exhalative chert

	Au	Ag	Pb	Zn	Cu
	11	5.0	2.4	6.6	4r.

	Au	Ag	Pb	Zn	Cu
Tul. Chief.	.1	3.26	1.3	6.7	1.8

Iulsoquah Chief

25-26th 9 - Kuwaka → Battle Lk (Westmin)

Sept. 8/90
cim, kamb

- Randall Aulis

- 1990 - 'H' Lens = new disc → correl. with A and B Lenses!

Pol. Ged. res to 3500 Level: 5.3m lens etc. → prob. double now ¹⁰⁵

Fw alt'n pipe below ms 'unit' (lenses) - Fw and; Hw dacite ppacl.

Faults - initial growth faults = small sea floor grabens
4400E to 5100E boundaries

A-B Lens: 900ft long x 1400ft deep

H Lens - in dacite-rhy Hw (above A-B lens)

- dip flattening to ~58° W

- excellent composite geol. X-sec!

- H Lens - consid. amts. of visible gold, plus barite (26-30%)

- soft sed, defn. Fex

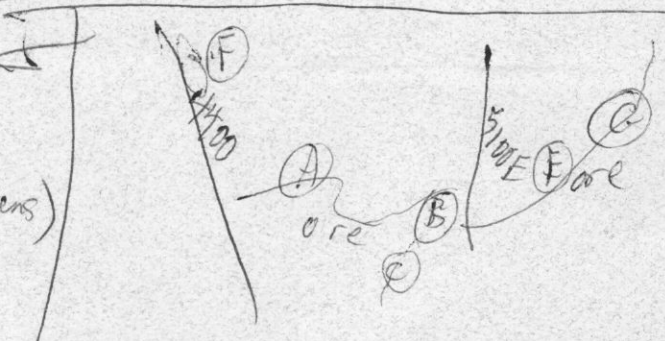
Age Dating: try ser-schist } Alt'n (K-Ar)
 } bio-schist
 } rhyolite (up hill) - for zircons.

(420-531 Van)

Kerr
Camp

420-5175 (Van)

Open Sh.



1997 ←
 - Island
 - 5 miles east
 - H. A. A. X → 2002
 - Bell copper → 1997
 Plus EXPANSIONS

Submerg. (ditch)
 ① Kerr?
 ② Crystal Peak
 ③ Golden Boat

④ Dons Mtn.
 ⑤ Mt. William
 ⑥ RR
 ⑦ Mt. Polley
 ⑧ Snp
 ⑨ Eskey Cr.
 Golden Boat

ORE RESERVES: eg. Butte Lk.

Geological Inventory: ore in ground

Each ore body: "unique geol. phenomenon"

Mining Reserve: tons + grade that finally reach the mill - incl. mining res., resource, + other

Afton-Ajax: - excellent slide of completed Afton pit (Lorne band - geol.)

Afton - 4/6 res. = 10.5 mt tons @ 1.5% Cu + .03 opt Au

Concentrate
Cu = 21% (low)
Au = .3 to .5 opt

Ajax: Intense albitization of diorite(s)

- minor MoS_2 , tetrahedrite, bn, cc, cov.
- Au with cpy, ret py
- higher Au correl. with chl - carbonate alt'n. (NE-trend)
- use of Cu-Au ratios (eg. 20-40:1 = high grade)

Recoveries = mid 120% for both

ex. .3% Cu, .02 opt Au



TULSEQUAH MINING CAMPLocation + Access → grew up in late '20's.

- Tulsequah - a former customs station, airport + supply depot between coast + interior - 50 miles NE of Juneau
- during mining - regular river-boat service from Juneau → 5 to 10 hrs then motor rd. connecting landing with camp + mines
- airstrip by Polaris-Taku = twice-weekly flight to Adlin
- discontinued in 1957 (mining ceased) + 300 people moved out
- lower 20 miles of Taku R. thru Alaska

Previous Geol. Work

- Cockfield + Kerr (G.S.C.) - 1926 + 1930-2 resp.
- Aitken (GSC) - 1955 + Souther (GSC) - 1958-60 incl.

Physiography

- NW trend of Boundary Ranges interrupted by broad valleys of Whiting + Taku R. which flow SW.
- peaks are steep + rugged.
- total relief 5,000 to 7,000 ft.
- self-dumping glacier-dammed lake - Tulsequah Lk. ^{12 miles above mouth}
- 3 miles long x $\frac{1}{2}$ mile wide - dammed at 1 end by short trib. to Tul. Glacier
- lake fills to 200 to 350 ft. when water suddenly drains out undermining the ice + discharges at base of Tul. Gl. ~ 3 days = 8,000 to 13,000 million cu-ft. of H₂O in Tul. R. = catastrophic flood - chaotic pile of broken ice, some icebergs over 100 ft. high. - cycle occurred ^{annually} since 1942 + periodically for 60 yrs.
- periodic outbursts of H₂O assumed great economic sig. during operation of mines. → town at Polaris-Taku, rds. from town to mill, + mines to mill + bridges = destroyed.
- Taku valley rel. free of fog.

Glaciation

- ice converged on Taku valley from NE + SE + flowed SW.
- receding glaciers at rapid rate i.e. better + new exposures.

2

similar to Vancouver Island 'sequence'?

General Geology

- 2 main divisions separated by major upc below U Tr.
- lower div. = Perm. + M. Tr. + older strata of unknown age
 - intensely folded + regionally met'am.
 - phyllite, greenstone (east) to amphib. gneiss (west)
- Stikine Arch - great salient of older layered rx. + intrusions with ^{NE trend}
- Atlin Horst - large wedge-shaped block of older rx. bounded by faults assoc. with ultrabasic intr.
- Between these - Mesozoic sed. + volcanics = Upper Div.
 - not regional met'am., nor intensely folded
 - sed. show marked facies changes from off-shore types in NE to near-shore types towards SW
 - Granitic rx. of Coast X-line belt in west. → pyroxene diorite to leuco granite: Mes → Ter. time
 - youngest intr. genetically related to early Ter. Sloka Gp. volcanics
- all units overlain ~~by~~ upc by flat-lying Tertiary + Pleis. basalt.

Met'am Rx.

- south of Polaris Taku Mine + in mtns. south of Mt. Ogden = gradation from gneisses to schists of map-unit 5 into phyllitic sed. of map-unit 7.
- exceptionally high silica content + presence of 1st. suggest correlation with Permo-Carb. chert-1st succession.
- rx. of map-unit 5 - met'am + deformed before U Tr. rx (i.e. frags)

Permian

- unfossil. rx. near Mt. Ogden included.
- 1st beds, interbedded ^{locally} with chert, shale + ss.
- 1st - fn. gr. massive.
- 5 overlain ~~by~~ (conformably) by thin-bedded chert, sil. arg., slate + phyllite (7)

Triassic + Older (No. 4)

- fn. gr. clastic sed + intercal. volcs.
- intensely folded + sheared = greenstone + chl-anph schist

Upper Triassic $\left\{ \begin{array}{l} 1) \text{ King Salmon Gp} = \text{clastic sed.} \\ 2) \text{ Stuhini Gp} = \text{volcs.} \\ 3) \text{ Itanakta Fmn.} = \text{lsv.} \end{array} \right\}$ Kerr (1948)

1) + 2) = thick, extremely variable succ. of eug. sed. + volcs. sed. = dark, poorly sorted composed of detritus eroded from ancient volc. terrain, commonly mixed with ash + coarse pyrocl. - exhibit rapid lateral changes in thickness + lithology = extremely active tectonic conditions. - lithological corr. possible only over short distances.

→ difficult to distinguish 1 + 2!

$\left\{ \begin{array}{l} 4 \text{ argill + ss, gnlc, ls + clastic} \\ 3 \text{ thick tuffs, gnlc, ls + clastic} \\ 2 \text{ lower volc div = lavas + tuffs} \\ \text{base} = \text{cgl.} \end{array} \right\}$ → dk green and

STUHINI Group (No. 7 + 8)

- ~~belt~~ belt → refer to map!
- Two Assemblages

- 1) ^{SW} near Sittakany Mt. - predom. of andesitic rx.
- 2) ^{NE} near Trapper Lk. - " " basaltic rx.

- some overlap of flows + clastic rx.

→ each assemblage exhibits a facies change from predominant flows + pyroclastic rx. on SW to a mixture of volc. + derived sed. toward NE.

1) SW assemblage = basal cgl. up on t. / overlain by at least 12,000 ft. thick ands. flows + pyroclastic rx. interlayered with cisp. bx, volc. cgl., + lesser gnlc + ss

→ opened with intense + widespread volc. + closed with sed. - detm + erosion intervals

SINW Fmn. (9) → Upper Tri.

→ one of most useful horizon markers in NW BC.

- thick 1st. crosses Taku valley at Sinwa Mnt.
- extensive thrust faulting along rel. weak plane.
 - eg. King Salmon Thrust fault, → movement from N/E to SW, eg. min. displace = 10 miles.
- u/c on Stuhini + King Salmon rx.

Laberge Gp. (10 + 11) - L. + Mid. Jur.
 - conformable clastic sedls.

Upper Cret. + Early Ter.

- Stato Gp. (14)
- preserved in down faulted blocks
- intermet. to acid volcs. + derived sedls. u/c on Jur. + older rx.
- "Whiting Lake" centre.
- pyroclastic rx!

PLUTONIC ROCKS

- 3 classes:
- 1) Coast plutonic^{s+w}
- 2) minor intr.
- 3) ultramafics.
- 1) foliated QD → migmatite, gneiss, → QM
- 2) great varieties of tex. + comps. → U. Cret. or early Ter.
 - intr. into Stuhini rx. = eg. Sittakanay stock. - Gd.
- 3) -

STRUCTURE

- related to 3 main episodes of tectonic activity which culminated in 1) mid-Triassic, 2) Upper Jur. + 3) early Tertiary.
- each = major u/c 1) uplift, metam, gr. intr. 2) folds 3) similar.

Tectonic History

- stable, shelf cond. during late Permian = thick, widespread carb.
- gradual change from carb. to chert + fr. clastic dep. = begin uplift in west
- sudden + widespread appear. of chert above Perm. lsv. = release of silica into sea by submarine volc. which later produced thick flows + volcanoclastic rx.
- uplift, folding, + metam. + intr. between Mid + Upper Tr. = marked hiatus between Upper Tr. + older rx.
- U. Tr. extensive volc. in Tul. area. = thick piles of volc. + volcanoclastic rx. → Stuhini Gp.
 - presence of polymictic cgl. with xline clasts (in lower part of Stuhini Gp.) = Coast xline belt emerged during U. Tr.
- subaerial flows + volc. islands during early Stuhini time
 - locus of volc. shifted NE
- uppermost Tr. = quiescent sed. → more stable
 - = Sinwa Fmn. → low emergent area near Stikine Arch
- early Jur. - locus of profound activity. → rapid uplift of Coast Mts. Belt + Stikine Arch
 - volc. activity - absent

ECONOMIC GEOLOGY

- ^{History} gold discovery along Taku R. as early as 1875. → "Taco R."
- during Klondike Rush of 1897-98 - Taku used as route to Interior.
- 1910 or 1912 - knowledge of Tul. Chief. → Alaska Sinean Gold Mining Co.
- 1923 - Tul. Chief discovered on east side of Tal. R.
- 1929 - active devel. of Tul. Chief. → United Eastern Mining Co. (dropped 1930)
- 1929 - Big Bull + Polaris Taku + Ericksen - Ashby + others found. → Alaska Sinean Gold (dropped 1930)

~1930 - advent of gov't officials + customs = end of free + easy passage between Alaska & Canada.

early attempts at devel - abandoned.
1937 active devel. on Whitewater
Whitewater (now Polaris-Taku) brought into prod. → Gold price ??

1937-1951 Polaris Taku - 719,336 tons of ore milled yielding Au valued at > \$8,000,000.

After 1951 - mill & camp leased to Cominco which started prod. from Big Bull (Manville) & Tul. Chief. (1951)
→ Ore from both mines - trucked to Pol. Taku mill & con. shipped by barge down Taku R. to tidewater.

1951-1957: Combined prod. from Big Bull & Tul. Ch.
= 1,029,089 tons ore milled, yielding
94,254 g Au, 3,400,773 g Ag, 13,603 tons Cu,
13,463 tons Pb, 62,346 tons Zn & 227 tons Cd.
- closed - 1957 - low metal prices

Geological Associations

→ close correlation between type of min. & geol. envir.
Cu: assoc. with U. Tr. volcs., 2) QM of Coast plutonic 3) felsite por.
- within Stuhini volcs - joints & dissem. in shear zones.
- Fae & Bing (NE) → + MoS₂

MoS₂ - younger QM & related leucocratic phases.
eg. Nan, Elaine, Moly-Taku - Whiting Lk. west area.

Base Metal Deposits

- sig. amts. of gold and silver occur as replacement bodies in sheared Stuhini volcs. (Tul. Chief & Big Bull) in sheared Permian 1st (Erickson-Ashby), & in QFP bodies cutting Stuhini volcs.
- each deposit is in or near Stuhini volcs. cut by younger felsite intr.

- country rk. is highly silicified, carbonatized, + albitized + ab. fn. dissem. pyrite. The altered rock commonly contains qtz-carbonate, barite, or stibnite stringers.

- principal ore mins. = cpx, ZnS, PbS(Ag) + tetra
→ arsenical gold (Pol. Taku) occur in highly frac. + carbonatized Stuhini' vales. Arseno(+Au) is dissem. in altered rk. + in qtz-carb stringers.
Sb - ^{veins} rk. altered to qtz + carb + fn. dissem. py.

Alteration Zoning? + Metals

- MoS₂ - tops of intr.
- Cu + MoS₂ in small stocks, etc. (Ving, Fae)
- Cu-Pb-Zn found in alt'd wallrk. adjacent to felsite cupolas eg. Tul. Chiet, Erick, Ashb.
- veins of stibnite + barite - ab. in outer part of alt'd zones → above actual intrusion.

POLARIS-TAKU (White water)

Reserves (1950)

- 1937-51 (ex. 1942-46 = war)
- Au prop. - Au occurs ~~in~~ fine needles of arseno. dissem. in fault-bounded wedge of Stuhini' vales.
- deposits in shear zones containing numerous replacement veins adj. to which wallrock is carbonatized + locally albitized

145,836 tons @ 0.25 to 0.6 g/tm Au

TULSEQUAH-CHIEF - disc. 1923 - attracted by prominent brown-yellow blue

- 1951-57 (Cominco)
- occupy shear zones in alt'd Stuhini' vales. Alt'n assoc. with large felsite dykes + NE trending faults.
- massive, fn. gr., py + cpx in lenses + ZnS, py, PbS in dense

1929 - 0.1 g Au, 3.5 g Ag, 1.75% Cu, 6% Zn, 6% Pb

gts-carb-barite gangue.

Cu, Pb, Zn, Au, Ag, Cd

BIG BULL (MANVILLE) - disc. 1929 - US interests up to Depression then Cominco in 1946
1951-57 (Cominco)

1929 - 0.12% Au, 6% Ag, 2% Cu, 1% Pb, 15% Zn

- similar ore to Tul. Chief., comprising mixed sulphide replacement of sheared & highly altered Stuhini volcs.
- Alt'n related to dykes & NE faults.

ERICKSEN - ASHBY

- first staked in 1929 + devel., incl. hand-trenching & ddh - carried out intermitt. until 1963.
- 1964 - extensive ddh
- massive sulphide replacement of ls + lying immedi. below Stuhini volcs, which are cut by a large tabular body of fn. gr. QM.
- Px , ZnS , PbS , freibergite.

RED CAP, B.W.M., THORN, BING, FAE, NAN (moly-Taku)

GENERAL GEOLOGY

- ores in host Upper Triass. volcs. y/c on Paleozoic volcs + sed.
- ores - "related to QM body to east"
- NW ^{Tulsequah} & NE ^{Taku} faults
- faults traced > 15 miles - series of parallel breaks.

TULSEQUAH - CHIEF

- oldest rx. are 1st & argill - Permian.
- overlain by Upper Trias. volcs. - lower volc. div. - Stuhini
- Stuhini Rx. - intermed. & acid.
- 1) Intermed. - greenstone flows & frags.
- 2) Acid - QFP - both intr. & extrusive phases
 - restricted to small area in mine within 'greenstone'
 - all orebodies lie within wedge of QFP.
- felsitic & ands. dykes ab. - esp. along shears.

Orebodies

- pyritic replacement bodies & stringer lodes localized within main shear zones.
- elongated either along shears or x-fracs.
- steeply pitching chimneys, traced to depths > 1200 ft.
- near nose of porphyry - stringer lodes 30ft wide x 500ft long
- irreg. dist'd shoots of various sulphides
- Py - most common - massive, fr. gr., replacements which may form layers, or irreg. masses, within orebodies.
- ZnS - most ab. - rel. Fe-free - dissem. in schists, mass. sul. repl., or bands & stringers repl. mass. py.
- Cpy - intim. assoc. with py.
- bn + tennantite - local conc.
- PbS - intim. assoc. w. ZnS.

- Orebodies surrounded by alt'n 'haloes' of inner, non-sil. portions, highly sericitic, but with recognizable smaller areas rich in barite + anhydrite, and an outer, broader envelope, high in qtz.
- Gangue = sericite schist + sulphate mins. of inner and

Ore Control

- intersection of regional faults + QFP wedge.
- due to incompetency of QFP vs ands. rx.
- porphyry is combo of intrusive, blow, + bx
- upper stringer lodes play out at depth.
- shears 'tighten' in ands. + thus unfavorable ^{For} ore
- shears = locus + transport media.

BIG BULL MINE

- Stuhini Gp. vales - U. Tr. - higher in section than Tul. Ch.
- greenstone + frags.
- thin-bedded tuft overlies it.
- mine area intersected by steeply dipping NW (Tul.) faults with assoc. foliated zone some 2000 ft. wide. Dip 70° S.
- narrow green dykes common follow structures which have controlled ore dep. + intim. assoc. with orebodies.

Orebodies

- sul. repl. + stringer lodes occur adj. to main fault or in its ^{minor} struc.
- bulk of prod. from one large sul. repl. body
- wedge of schist between 2 faults almost completely repl. by sul. in 1 large sheet - max. width of 100 ft. + split into 2 branches along structures. + stringer lodes in schist
- ore shoots rake to south.

- same minerals as at Tul. Ch. but less py.
- Siliceous alt'n zone envelopes controlling strucs. + extends along main fault V. for great dist.

Ore Control!

- fault - main control! + branching slips.
 - banded tuft VS massive fragmental (mine) which may have caused tuft to act as dam to min. fluids ascending along fault.
 - unfort. - present level of erosion has removed tuft
-

ECONOMIC GEOLOGY

- 1) Shear zone deposits lie in sheared zones that parallel local structure & usually lie in or close to axes of minor folds
 - orebodies formed when ore fluids encountered rx. susceptible to replacement. i.e. Perm. 1st. & Stuhini volcs. in most deposits found immedi. above upper contact of pre-Perm. rx.
 - dep. of ore fluids - fairly rapid. Eg. Tul. Ch., Bull, Er-As.
- 2) Anticlines - bedding migration eg. replac. in 1st
 eg. Erickson - Ashby
- 3) Irregular Mass - not related to structure. Eg. Yellow Bluffs

→ All replacements surrounded by zone of alt'd mins.
 Host Rx. = Stuhini ands. flows, bx, tufts - first sheared along definite zones or irreg. frac. should be anhydrite?
 - ~~metals~~ py accompanied by fluorite + gtz + albite + then cpy, ZnS, PbS

TULSEQUAH - CHIEF → 1951-57 Produced 1,029,089 tons incl. 94,254 g Au

- 7½ miles above mouth of river → 'top' + 'bottom'
- 2 alt'd shear zones. (3000 ft. apart) - work mainly one l.
- both zones on anticlinal structures.
- dip of alt'd zone - steep NW
- A Level - 40 ft wide; B Level - (200 ft below) - 10 ft. wide; ddh (100 ft below B) = 70 ft. wide. i.e. Pinching & Swelling
- south of workings - zone appears to widen to 900 ft.
- numerous offshoots + sub. zones.

→ cpy, py, ZnS, PbS - fr. gr.

15 samples: Cu - 7 sa. below 1%; 5 sa. 11 to 26%, 2 sa. 2.6 to 6%, 1 sa 14%
 Zn - 2 to 10% Ag ≡ Zn
 Pb - Tr Au = no partic. rel.
 Au - 0.1 to 0.3 g/ton
 Ag - 1.6 to 15 g/ton → 'lower' alt'd zone - "untested"

(1951-57) combined prod. with Tul. Ch. incl. 94,254 g Au
= 1,029,089 tons

BIG BULL (MANVILLE)

- 2 miles north of Tul.
- 1930 - work done. - 1950 ft. adit + X cuts + ddh.
- similar to Tul. Ch.
- in Stuhini vales - 400 ft. southeast of steps. of red + grey schists = minor anticlinal of Paleozoic strata.
- > usual massive green ands. plus much magnetite (up to several inches across). Alth' of mag -> hem = jasper-like + also veins of jasper.
- vales cut by shear zone striking NW/45°SW. - much wider zone than on Tul. Ch.
- narrow for about 300 ft + then up to 200 to 300 ft wide
- zone branches + splits.
- > 8 trenches on main orebody = 900 ft. long on surface with max. width of 27 ft.
- 3 sa. Au - 0.1 to 0.2; Ag - 6 to 7.5; Cu - 1.6-2.8%; Zn - 12 to 20%
- > other smaller lenses up to 30 ft. max. -> pinch + swell.

POLARIS-TAKU - Produced 753,255 tons (1938-51) incl. 231,604 g Au
Reserves (1950) = 145,636 tons @ 0.4 g/ton Au

- 1929 disc.
- 1931 - extensive trenching + ddh.
- great no. of veins - at least 10 - good Au values over 1 to 15 ft
- > veins - complicated + poor Au recovery.
- Geol. - green, massive, ands. + silicified tuffs, alternate with phyllite + schist.
- tuffs = 300 to 500 ft. wide
- schists = 100 to 200 ft. wide = more argillaceous ones
- > 'best' near contact of ands. + schist. - vein 2 to 25 ft wide
- av. 8 ft. - devel. over 1000 ft. + -> + entirely in gneiss

Oreshoots + Min

later

Au = Arseno.

- arseno. ^(+Au) py, stibnite, (po), Au
- 4 to 5% sulphides in veins.
- fuchsite ab. + some ankerite + silic. *
- carbonation
- shattering 4 or 5 times.
- 50 to 800 ft. in length with widths to 35 ft. → pin + swell. Greatest vertical - 400 ft.
- Min. in area 2000 sq. ft.
- sa - up to 1.5 g/ton Au. av. Au = 0.25 to 0.60 g/t

ERICKSEN - ASHBY

- 1929 → 32 = work.
- pre-Permian sandy argill. + grites overlain by Stahling ^{unit}
- separated by sheet (few ft. thick) perm. lst.
- Folding produced numerous discontinuous sheets
- min. solns. repl. lst + shear zones in vokes.
- 3 repl. patches of lst on steep wall - largest 400 ft x 100 ft. → in anticlinal struc
- py + ZnS, PbS + minor cpy.

Questions for Casselman?

Jan. 16/91

Stratigraphy

- west limb of northerly plunging anticline
- Chief Fault = ~~growth fault~~ regional structure? regional terrane boundary regional growth 4400
5200 reactivated
- Fusulinids from 1st. in Tul. seq. below the MS dep. are Mid-Penn in age Stratigraphic
- ⊗ (ie. VMS dep. are post Middle P + pre-early Perm. above!!!
- Diorite - contemporaneous? coeval?
 post-min. feeder to overlying andg.
 post dacite - intr.
 (feeder to volc.)
 cut by A10 cut by Tert. dyke

TULSEQUAH CHIEF

Jan. 16/92

- Mike Casselman
 - new age date from zircon in rhyolite
= 352 Ma [L. Mississippian]
 - confirms that deposit is in core of ANTICLINE
(as Payne, Casselman, et al suspected/suggested)
-
-

Proposal: Tul. Chief paper by Casselman, Schroeter & Aulisio (OK with Cominco / need to incorporate Redfern data).

Tul. Chief

May 193

278-3028

TGS. Terry Chandler

start - next week - line cutts

- Big Bull

- SE - Tul. Chief

20 people camp?

- felsic vols. - Spaulding/Banker

geophys - 3rd. wk. June

surface drilling - mid - July

WG - in fill - Tul Chief
(mid - third wk. June)

and July - visit by TGS / Wajdak ✓

Alan's Taku - late June - early July
Chris Marriott - married

TULSEQUAH CHIEF - Terry Chandler (Redfern) Mar. '94
(Rock Talk VIII, Smithers)

1 m oz Au cont'd

~~1.9 m oz Ag~~

New Reserve

* 8.6 m tonnes of same grade
(slightly higher Ag)

Cu con. 28 to 29%

Pb " high 60s

Zn " 55%

- jib + centrifuge - will get most of gold

- Ag reports to Cu con. + Pb con.

→ excellent metallurgy!

~~Pre-feas. metal prices \$US~~

~~Cu - 1.00
Pb - 0.35~~

Mineable = 7.0 m tonnes

Cap. cost \$Cdn 138

Mine Life = 9 yrs.

(after-tax IRR = 22%)

Prod. 181 m tons
.6% Au
.007 opt Au

SMILO - Sove Blower
Tues. Apr. 12/94
KEG '94

25,000
4 PD

Reserves (Inventory)
~~115 m tons~~ 115 m tons @

- Excellent slides!
(incl. airborne EM survey!)
Chopper

TULSEQUAH
Since 1987 ~ \$12m spent on expl'n

\$3.0m expl'n in '94

GOLDEN BEAR \$38 million for roasting plant. US #247/02 - open cost

Mine Grade: 15 opt Au - Good slides eq. X-sec. - Bear Main + Grizzly (below)
+ aerial (labelled) + Long. seg. + Fleece
Fleece haul - pre-ore felsic dyke (dated) ~ 7% of deposit ore (refractory) ct. carbonate hosted (93%)
Kodiak - carb. hosted (+ hem. fault group) - heap leach (non-refractory)

- talk to Dunham - fax him at the mine re-copies

Ashwood - Ron McMillan - TGS photo in Monthly Report (with Aldrick) - old (deceased) prospector (in Stewart)

'1100 zone' - plug near by

both: VMS - Eskay style - host 'turbidites' (greywackes)
Targets: ① Epithermal

TULSEQUAN CHIEF

Minerals North (Smithers)
Apr. 20/95

- Bob Carmichael

\$14 million spent since 1987 on expl'n.

3 Ore Lenses: AB, H, I.

75% of res. in H Lens (in syncline of fold)

730 m down dip
(25 m thick at 'bottom')

UPDATE: 1995 - no expl'n.
→ feasibility study

geol 8.5 m t 1.4 1.2 Pb 6.5 2.5 g/Au

Minerale 7 m t @ 1.4 Cu 1.07 Pb 6.42 Zn
2.4 g t Au 93.37 g t Ag.

→ U/G mill complex (in gabbro complex - HW)
25000 TPO Mine Life: 8 yrs.

PX conc. → backfill ; 25% Au rec. (1200000/y) by gravity
- bulk Cu, Pb, Zn conc.

Metallurgy : 2 conc - Zn (90 m lbs/yr) + Cu
50,000 oz Au/yr.

Access - prefer river barge

Sept. '96 - File Final Application for MDC.

June '95 - Finish Feasibility Study.

Rock TALK TV (Smithers) Mar. 5/96

TULSEQUAH CHIEF - Bob Carmichael

9 years + - mine life

\$ concentrates:

- a) Gravity - 70% Au 6352 g/t
- b) Silver in lead ^{leap} conc. 20% Cu
- c) Zn conc. 59% Zn
- d) Pyrite conc.

Potential to prod. Pb conc. (out of Cu conc.)

56,000 oz Au
2.42 Moz Ag
22.24 M lbs Cu } per yr.

NSR Zn - 50.6%

- need 8 megawatts power
- add 1st to tailings
- flood on abandonment

Snora

Snora Mining Seminar

Vancouver, Canada

November 10, 1992



→ Mining Week May 14/16

Tulsequah Chief: (Chandler) - up to 29% of gold by gravity

Golden Bear: (Tredger) - [Mother lode (Gramma) = Lucra - \$0.25M] → past prod. 185K Au from mainly Cu prop. (new co.)

- West zone: \$1.6M to test 10 drill targets in carbonate
- new (proposed) heap leach pad just NNE of USA dep.

HKie: (Graf) ket 28 - \$0.5M ✓ in early '96 (17ddh)

Taurus: (Howell):-

Pilldolla and JI ⇒ VMS targets (Jervis Inlet)

→ shear zone in Cambrian Gp. 14.

" Brown Mountain property → Ashwood - '95 - J.P. survey = several anomalies → agreement with a major to take on project!

Georgia River: '96 → 11,000 1.4 opt Au

'96 - test for high-grade to west (down-plunge) est. \$1.9M to build rd. to tidewater (→ needs a little more tonnage). → custom mill @ Premier.

Cassiar Asbestos (Barrie Kovacs):

TULSEQUAH CHIEF

Oct. 21/98

— update / summary for
(chat with Bob Carmichael)

'98

- * rec'd Proj. Certificate in Mar. '98
- * submitted SUP application for road
- * ongoing enviro. work
- * actively seeking JV partner (+ \$)

FAXED

Fax Cover Sheet

DATE: Mar. 23/98 TIME: 1:10pm

TO: Gerald German
ADM - Energy & Minerals
Vic.

PHONE: _____ FAX: 952-0121

FROM: Tom Schroeter PHONE: _____
FAX: 604-775.0313

RE: TULSEQUAH CHIEF / TAKU AREA

CC: Ron Smyth, GSB.

Number of pages including cover sheet: 2

REMARKS:

Urgent For Your Review Reply ASAP Please Comment

Message

Gerald - in dealing with Steve Borell, Exec. Dir. of the Alaska Miners Association, Inc. (in Anchorage) last week concerning the Tulsequah Chief/Taku project/area, he faxed me a copy of the attached letter from Governor Knowles. Steve is very concerned that the Governor is being "misinformed".
Head's up.
Tom

TCS -> Tul. Chief.

TONY KNOWLES
GOVERNOR



P.O. Box 11000
Juneau, Alaska 99811-0001
(907) 485-3000
Fax (907) 485-3502

STATE OF ALASKA
OFFICE OF THE GOVERNOR
JUNEAU

February 4, 1998

Ms. Peggy Wilcox
419 Sixth Street, #328
Juneau, AK 99801

Dear Ms. Wilcox:

Thank you for contacting me regarding the proposed Tulsequah Chief mine project along the Taku River in British Columbia (B.C.). I appreciate the many Alaskans, including fishermen, conservationists, and Taku property owners who have contacted me to express concerns about the effect of the mine on our fisheries and water quality.

My Administration requires resource development projects be based on a "doing it right" philosophy or not be done at all. Doing it right is based on the principles of sound science, prudent management based on conservation, and a responsive public process which brings Alaskans to the table.

I share the concerns of many that this proposal may cause harm to Alaskans by damaging valuable Taku River salmon runs. The Taku's resources are fundamental to subsistence, sport, and commercial fisheries, as well as Southeast communities. Past experience brings into question B.C.'s ability to undertake resource development while doing it right and protecting salmon habitat. Alaska needs reassurance critical issues regarding the resource values of this river are fully addressed. The Departments of Fish and Game and Environmental Conservation, and fishing groups have all examined the Tulsequah proposal and raised serious concerns about the development's impacts on fisheries.

Alaskans have expressed frustrations to me that although we will see little economic benefit from the mine and may bear the brunt of negative impacts of the project, we have limited opportunities to influence its development. In fact, although Alaska does not issue permits for the mine, we've taken an active role in reviewing the proposal. State agencies have been involved in the B.C. assessment of this project since 1994.

At the Project Committee recently held in Canada, the State of Alaska once again raised concerns about the project. At this meeting, the committee did not approve the project as expected, but decided to continue its review. However, we still expect a decision on whether to proceed or not will soon be made. At this time, we do not feel our "doing it right" principles have been fully addressed, and we hope the Canadians do not grant a certificate to the project until they are addressed.

If the Project Committee makes a recommendation which does not resolve our concerns, I intend to explore other options, including a possible appeal to the International Joint Commission, to protect Alaska's resources and jobs.

Thank you again for contacting me regarding this important issue.

Sincerely,

Tony Knowles
Tony Knowles
Governor

Same group that
alienated Windy (Craig)

TGS → Tul. Chief

Mar. 24/98

Lindsay Bottmer
President
BC + Yukon Chamber of Mines

Dear Lindsay:

RE: TULSEQUAH CHIEF / TAKU AREA

In recent discussions with Steve Borell, Exec. Dir. of the Alaska Miners Association, Inc., he alerted me about the 'pressure' on the Governor's office by 'self-interest' group(s). He feels that such groups are purposely feeding his office with misinformation. The result is obvious (see attached letter). Apparently more recent press releases/conferences have come out of the Governor's office.

I suggest you (i.e. BCYCM) monitor this situation - probably best through Steve?

cc. B. McKnight
Exec. Dir., BCYCM

Cheers,
Van Schroede

TOS → Tul. Chief

TONY KNOWLES
GOVERNOR



P.O. Box 11000
Juneau, Alaska 99811-0001
(907) 485-3800
Fax (907) 485-3302

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Sincerely,

Tony Knowles
Tony Knowles
Governor

Same group that alienated Windy Craig

TULSEQUAH CHIEF

July 25/01

- Tel. ((907) 563-9229) disc. with Steve Barrell, Exec. Dir., Alaska Miner's Assn.

Re: Updates/Recent News (BC/Alaska)?

i) Alaska: SB talked with Drew Pierce (US) + Secretary to Dept. of the Interior (Washington, DC), re - 'negative' memo to Jerry Chandler (Redfern) criticizing tailings impoundment project. (primary antagonist = Everett Wilson, Fish + Wildlife)

→ SB hopes to get 'proponent' Vijai Rai on committee.

BOTTOM LINE: More room for 'optimism'

PDAC '01
Rick Vicagie
(Breakwater, Tor)
very interested in
Tul Chief - needs devel.
access from Juneau, NOT AHI.

Nov. 25/02
TULSEQUAH CHIEF
OAWA Mining
(Toshiaki Suyama)
still interested in.

Wednesday April 16th

George Whately... work plus \$2M in OT - Gov (and disposal of...)

KEG '05

8:00 AM Coffee and Muffins Sponsored by ALS Chemex.

Southern Rio Resources Ltd. Technical Session (Chaired by Mike Cathro, BC Ministry of Energy and Mines) Theatre Sponsored by Navasota Resources Ltd.

Table with columns for time, speaker, company, and topic. Includes speakers like Bob Lane, Lindsay Bottomer, Dave Blann, Jim Oliver, and Heather Neufeld.

500m vertical - skarn min. Ag: Au ~3:1

"Cu-Fe skarn (previous metals enriched) distal dissemin Cu-Au dep. (a la Baffle Mtn, Newy)

10:10 Coffee and Muffins Sponsored by J-Pacific Gold

SabreX Contracting Ltd. Technical Session (Chaired by Linda Dandy, P&L Geological Services)

Table with columns for time, speaker, company, and topic. Includes speakers like Rob Pease, Dave Gadfield, Lorne Warner, and Mitch Mihalynuk.

93 Ma stock 70% interest

Cyprus: 1.6 Moz - 1.34 g/t Au

TAURUS Sable - bulk tonnage target - 2006, Taurus West Zone

Tas prep. Gold (k. prop. barrier)

12:00 Dinner's Lunch Sponsored by BC Drilling Companies and Suppliers

DRC Resources Corp. Technical Session (Chaired by Leo Lindinger, Renaissance Geoscience Services)

Table with columns for time, speaker, company, and topic. Includes speakers like Stan Hagen, Paul Woidak, Scott Broughton, and Bob Carmichael.

analogy: Myra Falls 'M in '03 (expl'n)

[4 g/t Au Equiv.]

\$28M spent by Redcorp to date (~\$5M) on expl'n

3:00 Coffee and Tea Sponsored by BC Securities Commission

Eastfield Resources Ltd. Technical Session (Chaired by Colin Russell, Eco Tech Laboratory Ltd.)

Table with columns for time, speaker, company, and topic. Includes speakers like Dave Terry, Lucas Marshall, John Chapman, and Barry Ryan.

to visit Vowell Ck. (Ruth Vermont) Jasper Mtn (chat with Bud McClatchey)

Fe-carb-ser (shear) veins, peripheral to porphyry (e.g. falc. props to south)

Tuya River - good 'local' resource!

northern end (Cu) (4. Maybe showing) Sedex pot. (Alfred) Katie Cu-Au Property, Salmo BC

- recent paper (by email?)

7:00-9:00 PM Presentation and Discussion on "Mineral Titles Online" by staff of Mineral Titles Branch, Ministry of Energy and Mines Sponsored by Pacific Booker Minerals Inc.

Simon Kay's girlfriend defend M.Sc. thesis @ UWO (Mike Fleet) wants to initiate a 'mining' exploration course (degree?) @ UCC (College in Kamloops) not... will email

W
 T Horn - \$1.15M in '04 ✓
 QC ~ 0.1% Bob Ch. ~ 0.2 ✓
 Kalam \$1.4M in '04 ✓

Red Chris (Jan Smith) Min. North
 - presentation on bcmetals website. (Smithers) Apr. 16/04

0.35% 1.5B lbs Cu; 2.2M oz Au
 (Equi Area 11Moz)

Prod. = 72 kAu; 100M lbs Cu
 Target

Cap Cost ~ \$150M +
 Oper. Cost ~~\$45M~~ ~ \$630M

2004: \$3.8M (Red Chris + Fire Mtn)
 - 5000m ddh @ RC.

Fire Mtn: 1 km deep ddh in '04
 (Henderson, pl. target)

Red Chris Development Corp. - subsidiary
 of bcmetals

Salare Ct. (Doug Brown) Min. North
 - 'NovaGold to take over' speculation (Smithers) Apr. 16/04
 in June '04

Cap. Cost ~ \$400 - \$650M
 250 - 400 employees (+contractors) '04 - scoping study
 Access: i) due east via tunnel
 ii) ~150 km via strike then east
 (via Hwy 101)

SMITHERS TRADE SHOW TO FOLLOW: APRIL 16 - 18, 2004

od. - 2009
 MINERALS NORTH CONFERENCE APRIL 14 - 16, 2004
 Sim Muntzert - lead gen. syst + soft prod

2004: 20,000 m ddh ~ \$8M Pre-fers. - '05

APPAW - Fortune Mtn. (Red Chris) Good
 2002 - \$3.3M purchase @ Min. North (Smithers) - Apr. 16/04
 (+ \$1/tonne royalty)

\$65M prev. spent by Gulf & Kenneco
 51.46 MT - "Prov. + Prob."
 (Mining reserves)

2.8 BT 'total' resource
 Pulverized Coal Injection (PCI) - 'new' interest

→ ANTRACITE
 \$85M - Cap. Cost 1.757M tonnes

- potential for coal-fired power generation
 [BC req. 400MW by 2012]
 - new studies in progress.

2004 - update prev. 1991 Feas. Study
 Prod. - 2006 → late '04
 - marketing study "Exp'n" ~ \$500k!

TULSEQUAH CHIEF - Tony Chandler (Red Chris)
 @ Min. North (Smithers) Apr. 16/04

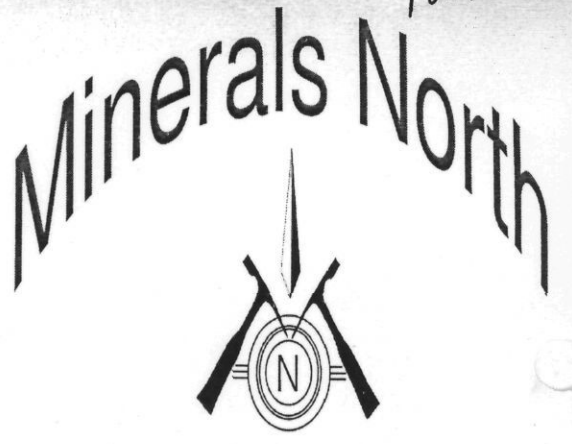
- extend 60m level ~ 160m to North
 - 30,000m ddh [\$5.5M]
 - New resource est. [43-101] Cap. Cost \$150M
 - update feas. study - end '04
 - spent 33% of 2003 exp. in Athl. (via Hx-Tech drilling)

SMITHERS TRADE SHOW TO FOLLOW: APRIL 16 - 18, 2004

MINERALS NORTH CONFERENCE APRIL 14 - 16, 2004

2004: 20,000 m ddh ~ \$8M Pre-fers. - '05

- 2004 - Tom Schwartz



Conference

"DEVELOPING OPPORTUNITIES"

April 14 - 16, 2004

'AT A GLANCE'

MORRIS DOW 200-250 employees
 10 yr. mine life
 20-25,000 tpd
 2005 - completed Feas. Study
 2006 - Cons. Feas. Study
 2007 (3 yr) - prod. 14.5% IRR 1.00M
 \$98M cap. cost
 Beaman Hill Assess 385 Ac

Tulsequah Chief (Aug. 4/04)

- Bob Carmichael
- '04 - 30,000 m ddh to end '03 - spent \$28M
- 327 Ma
- Deep drilling = 2nd (new) leg
- Ann. Meet. 91koz Au Equiv.
- Smelter: Pb - 4%
- Zn - 40%, Au - 28% Cu - 24%
- Ag - 18%

Analogy: Mjra Falls

- excellent metallurgy
- upside opt'n pot'l
- 102 + 106 holes ('04)
- 5' ex cell - eq. 30m

ADANAC (Dave Philip)

- Aug. 4/04
- * 90-95% recoveries
- * roast to molybdic oxide
- * Ship from Skagway

METLA (Dave Tupper) Aug. 4/04

- * gold 'target' (Pb + Zn + Cu)
- * 3 other JV's with Asphex
- * 1991: 10 ddh (Galicia)
- * carbonate-shear veins (HP)
- * Heterolithic bx
- * Veins in diorite
- * Au assoc. with pyrrhotite

Yellowjacket (Gudalund)

- Muskox Minerals Aug. 4/04
- Anorogenic mesothermal Qtz vein style (after Au)
- most of Au in stockwork
- Analogy: Maryland, Calif.
- mineralized diabase (esp. in fault zone) - frags. with Qtz + carb + gold

- 102 ddh - upstream of Discovery
- near Gold Run
- Pine Ck fault ~ 50m-wide
- tip to SE => drill to N.
- ie drilling down dip extent of fault.
- 300m strike of drilling
- computer modelling of all ddh
- Hatch: alt'd ultramafics

- Muskox using Homebake core
- 14 ddh by Muskox prior to Spring '04

- Gold in: i) Qtz veins
- ii) ls. + quartz (+ arsenic)
- iii) silica - flopped (carbonate ultramafite + talc)
- iv) diabase

- extreme nugget effect.
- > continue infill ddh
- ddh to depth
- airborne survey
- bulk sampling of shallower ddh intersections

TTHOM (Adam Stephens)

- Rimfire Aug. 4/04
- new oban bx - IP target
- Regional: 82-93 Ma rocks
- ddh in Sept. (Darcy Baker)

ILITRA (Aug. 4/04)

- Kobogoka
- 2053 of 15k. due to ice melt (glacier)
- late Crd. Gd. @ contact with metaseds
- Au - nearby (.27 to .75%)
- Mo - up to 1.9% Mo
- IP survey: N-S chargeability

- 2004 work
- further IP - in fill + '04
- 500 m ddh (2 holes)

2nd Atlin Geoscience Forum
Aug. 4/04

Tom Schrock

TULSEQUAH

889008

Cut
Rocks(in Smith's
office)

Tulsequah-Chief

- 1-24 Banded, fn. gr. mass. sul. - cpy, py, PbS with gtz. 'clots'
in intermed? Stuhini volc.
- 2-11 Mass. sul. w. gtz. 'clots' + rk. frags.
- 3-10 Mass. sul. - banded cpy - py - ZnS - PbS
- 4-5 Massive cpy - py - ZnS
- 6-38 Banded fn. gr sul - cpy + py + ZnS
- 7-41 'Rhyolite' w. py. veinlet
- 8-19 Mass. sul. - banded - mainly ZnS - PbS
- 9-22 Highly sil. volc. w. py + cpy.
- 12-16 Banded cpy - py - ZnS - PbS
- 13-18-21 Mass. sul. w. gtz. 'clots' + rk. frags parallel
to 'banding'
- 14-43 Host andesite
- 15-37 'Rhyolite'
- 17-33 cpy + py + PbS in gtz gangue.
- 20-42 Mass. sul.
- 23-26 Mass. sul.

25-34 Mass. sul. - cpy + py + ZnS

27-39

28-32 Banded cpy + py + ZnS + PbS

29-40 'Rhyolite'

30-36 banded fn. gr. mass. sul. - cpy - ZnS - PbS - py.

31-35 Massive banded sul. w. ab. sericite

POLARIS-TAKU

44-52 Mass. banded sul. (cpy - py - ZnS - PbS) with gtz. clots

45-47 Host? ands. volc.

46-57 mass. banded sul. (cpy - py)

48-67 ~~see~~

49-71 Well banded mass. sul. - py - cpy - PbS

50-68 Well banded mass. sul (cpy - py - ZnS - PbS) with gtz. clots

51-56-70 Mass. sul.

53-

54-69 Well banded mass. sul. (cpy-py-pbs)

55-65 Banded sul. w. gtz. + rk. frags.

58-60 Qtz w. epidote + precious metals?

59-66 Sil, sericitic rk.

61-64 Dust Tuff with fn. dissem + frac py. (à la Cooley!)

62-63 Mass. sul. - ZnS-pbs-py.

72-73 Qtz w. cpy + tetra?

BIG BULL

74-85 Well banded ^{fn-gr.} "mass. sul (cpy-py-pbs-ZnS) w. gtz. + rk. frags

75-76-77 Etc. - fn. gr.

78-86 Etc.

79-90 Mass. sul. w. abn rk. frags (dust tuff?)

80-84 Host andesitic frag. w. ~~hst~~ (jasper?) (hem?)

81-82 Chloritic schist w. pyrite porphyroblasts

83-88 Fn. gr. well banded mass. sul. w. rk. frags.

87-91 Etc. - fn. gr. ✓

92-93 Etc.

ERICKSEN-ASHBY

94-96 Magnetite-rich volc. + ZnS?

95-97

1-43

Tul.-Ch.

44-73

Pol-Taku

74-93

Bull

94-97

Erickson-Ashby