Sullivan

October 1, 1994

Exploration Techniques

- Samarium anomaly identified in RGS and Rob Cameron noted that there was another REE that flagged Sullivan
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Regional Stratigraphy

- footwall quartzite is possibly equivalent to Rampart Facies near Creston
- regionally 4% po in Lower Aldridge which shows up as rusty weaterhing surface
- Middle Aldridge consists of more pure quartzites (more properly arkoses??)
- Upper Aldridge - very thin ? consists of?
- seismic evidence shows possibility of more than 10 km of Lower Aldridge below known stratigraphy (Fred Cook)
- basement rocks caught up in listric fault associated with Rocky mountain Trench
- marker beds possibly better explained by increased silty material in interbeds derived from aeolian silt (P. Ransom)
- Belt-Purcell rocks get shallower water to the south and up section (Don Winston - a proponent of playa model for upper Belt strata

Setting
- believed to be a local basin with sediment moving north and northwest (Paul Ransom)
- overthickening of units because of basin with some units flowing up one wall and back onto themselves (Ransom)
- Red Sea appears to best modern analogue
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Host Rocks
- underlain by Lower Aldridge which consists of siltstones?, minor quartzites and footwall quartzite
- immediate footwall is conglomerate or fagmental derived from mud volcano located almost coincident with SEDEX alteration/mineralization pipe
- smaller dewatering structures believed to have coalesced to form volcano and destributed a layer of fragmentals as mass flow?
- another mud volcano to the west? beneath the gabbro arch that destributed framental at same horizon
- overlain by sheet flow quartzites, siltstones?, ...

higher in stratigraphy is 10 m of laminated carbonaceous units (marker beds) that correlates with similar rocks on concentrator hill and upper 10 m of regional Sullvan marker bed
- stratigraphy below these marker beds to base of orebody correlates with concentrator hill sphalerite-rich distal bedded facies which is extension of Sulivan orebody 5 to 7 km away
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Ore Zone
- massive ore directly above pipe (West orebody)
- banded ore to east and west (minor) of west orebody
- curent mining concentrating on banded ore
- Main horizon, A ,B,C, and .. bands
- bands can be ore, although grade decreases vertically
- B Band is a triplet

- bands are typically less than a metre??
- sulphides are all recrystallized and pyrrhotite has clasts of quartz and sediment that display classic " ---" texture which is characteristic of metamorphosed sulphides

- pyrrhotite replaces west orebody as fluids moved through the mound
- iron core represents later ersoo-cutting pyrite-qtz? alteration tiat flushed out metals? and provided conduit for hydrothermal fluids to alter overlying rocks?
- boulangerite cuts orebody as later veins
- pyrrhotite "slabs" DVL have slid from fringe of orebody to east to be incorporated in "debris flow"type deposits as A erraties beneath the A band - there is a large area of absent po surrounded by drill holes
- garnet in exhalite horizons reflectshigh manganes contents

Production
- used to produce Sn form cassiterite
- fertilizer as well
- current rate of mining will allow 7 to 8 years at 1.8 mt a year, like to mix Sullivan ore with that from Red Dog which is metallurgically more difficult

Alteration
- allanite crystals in chlorite veinlets and disseminated in Aldridge could give REE signature associated with RGS
- albite realted to gabbro sills and not Sullivan
- tourmalinite black and brown, more commonly black in conformable beds
tourmalinite assoicated with sulphides - po-spah-gal?
- tourmalinite forms pipe with stringer type? mineralizatiqn below and continues up to 100 m into hanging wall althouh it is largely replaced by serictie alteration
- latest alteration appears to sericite + which surrounds? orebody and is metamorphosed from what is presumed to have been originally a clay (kaolin alteration)
- unaltered Aldridge eontains biotite
- chlorite alteration is in core of pipe??
- tourmalinite alteration very easy to destroy "pussycat" DVL

Structure

- ken mclay's study showede that all minr folds? aligned in three sets which reflected the structural deformatiqn of the orebody

- extension of orebody to north at 5800"? is 30 cm thich and is part of Sullivan stratigraphic package and underlain by two gabbro sills cored by altered sediments (or granophyric sill core)
- definite potential for more ore
- 147 degree F water cfreates technical problem

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