5. MEGUMA GROUP-HOSTED BASE METALS: EASTVILLE (GOLD BROOK)

5.1 INTRODUCTION

In Nova Scotia the Meguma Group rocks of Cambro-Ordovician age have been known since the 1800s as hosts to gold mineralization. Exploration over the years for gold has yielded evidence of massive sulphide mineralization, primarily pyrite, in the host metasediments. Exploration in the southwest part of the province has outlined significant tin mineralization with associated copper and zinc sulphides in Meguma metasediments and these occurrences are described under the granite-associated class of mineralization in Section 8. Antimony and tungsten deposits are associated with veins in Meguma Group metasediments and at West Gore several fissure veins containing auriferous stibnite were exploited to a depth of 250 m. The deposit was re-examined in the late 1980s.

The best-known base metal occurrence within the Meguma Group is the Zn/Pb deposit at **Eastville** where mineralization in Meguma Group metasediments extends for 10 km along strike. This mineralization occurs around the transition zone between the predominantly greywacke Goldenville Group and the overlying, predominantly argillaceous, Halifax Group. This Goldenville/ Halifax transition zone is marked by a regional scale enrichment in manganese which several researchers, citing occurrences of manganese, tungsten and tin within the transition zone, have attempted to use as evidence of a widespread mineralizing event at this stratigraphic horizon (Zentilli et al., 1986).

The occurrence of base metal values within the gold deposits, the presence of massive sulphides in close association with the gold deposits, the presence of base metals with the Meguma-hosted tin deposits, and the occurrence of significant base metals at Eastville, make exploration along this 1700 km-long contact between the Halifax and Goldenville Formations a worthy exploration target.

The Eastville deposit, also known as Gold Brook, is the type example for this deposit class in the province.

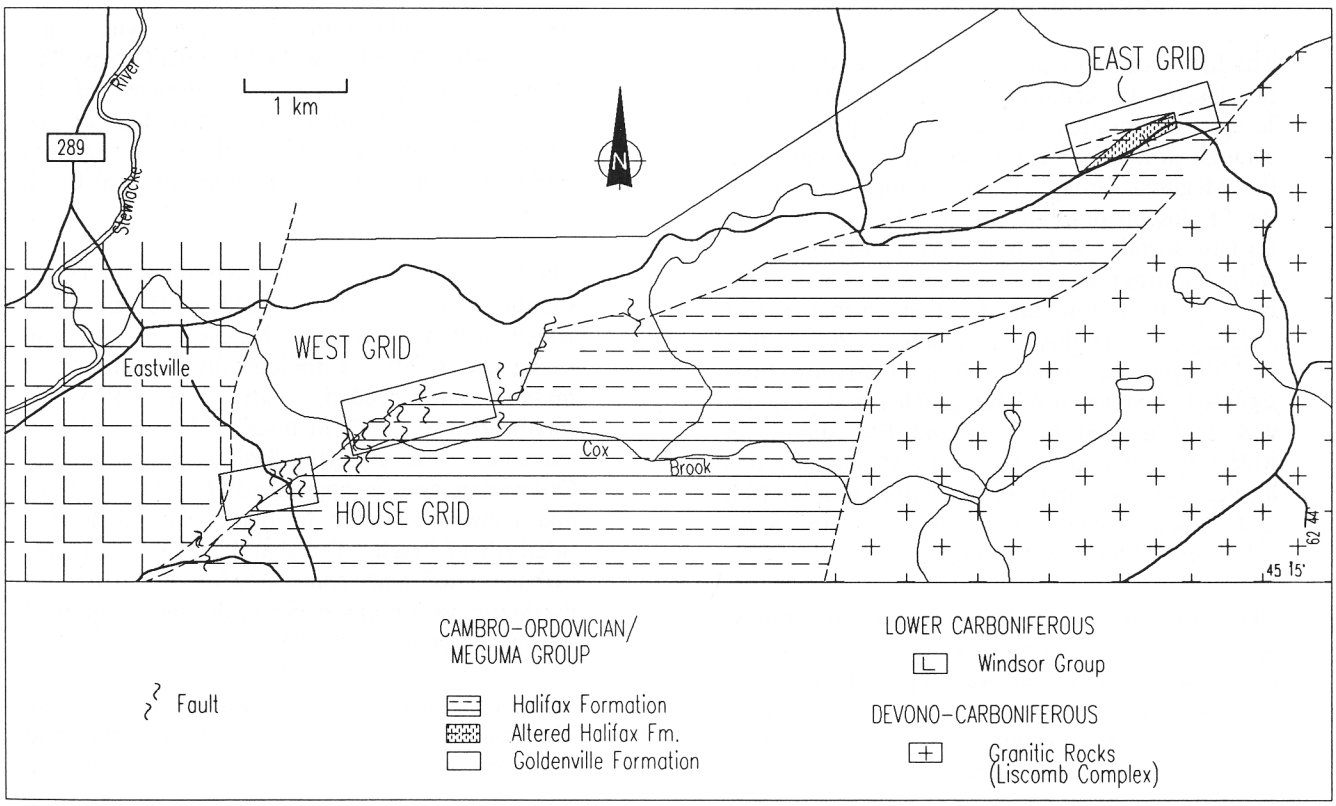

Figure 18. *Eastville (Gold Brook) deposit - Location and geology.*

5.2 LOCATION AND ACCESS

The Eastville or Gold Brook deposit is located 2 km southeast of Eastville, Colchester County, and some 35 km southeast of Truro (Fig. 18). The deposit is centred on latitude 45° 16' 30" N and 62° 48' 30" W on NTS map sheet 11E-7B and access is via a series of paved highways and pulp company gravel roads.

5.3 PREVIOUS WORK

The area was first mapped by Fletcher and Faribault (1902) and again by Benson for the Geological Survey of Canada in 1962. Neither of these surveys noted any mineralization in the area. Holman (Geological Survey of Canada, 1959), in his regional stream sediment geochemical survey, indicated anomalous Pb and Zn values along Cox Brook which traverses the deposit. Binney et al. (1986) confirmed and extended much of the early Fletcher/ Faribault mapping. The area was covered by the Geological Survey of Canada airborne EM survey (1960) and a significant anomaly was interpreted to represent a regional fault.

5.4 EXPLORATION HISTORY

The first recorded exploration activity was that of St. Joseph Explorations Limited in 1976 (St. Joseph Exploration Assessment Report 1977). Though primarily focused on gold exploration in the Meguma Group (Cambro-Ordovician) rocks the St. Joseph program also carried out analyses for base metals. A reconnaissance B-horizon soil sampling program, with line spacing of 1 km, was laid out to follow up the GSC airborne EM anomaly. Highly anomalous Pb values (>1000 ppm) were obtained from the first two lines sampled. Extension of this geochemical program was accompanied by a ground EM survey on widely spaced lines. A strong EM anomaly was located over the length of the claim group and Pb and Zn soil anomalies were detected in two areas coincident with the EM anomalies.

Diamond-drilling in 1977 intersected fine-grained sphalerite and galena and encouraging assays (up to 3.26% Pb and Zn/7 m) were reported. Following this initial success much more detailed geochemical and geophysical programs were initiated and included B-horizon soils, organic-bank stream sediments, and magnetic and EM geophysical surveys.

Between 1977 and 1982 twenty-eight drillholes totaling 3896 m were completed in three widely separated areas on the Eastville deposit (Fig. 18). Early drilling concentrated on geochemical anomalies along the geophysically defined Goldenville - Halifax contact. Later holes tested for down-dip extensions and also along strike in areas of no geochemical response. Australian Mining & Smelting entered into a joint venture in 1980 and an overburden drilling program was completed but no new target areas were identified. The last diamond-drill hole, DDH 28, returned the best intersection with 4.05% Zn+Pb/9.33 m, including a 2.13 m section assaying 4.71% Zn and 1.8% Pb (Binney, 1981).

The mining claims were relinquished by the successor company to St. Joseph Explorations in 1986, since which date the deposit has been under closure by the province.

5.5 REGIONAL GEOLOGICAL SETTING

Nova Scotia, south of the Cobequid - Chedabucto Fault System, is to a great extent underlain by rocks of Cambro-Ordovician age which are collectively referred to as the Meguma Group. The Meguma Group, comprising sediments of the Goldenville and Halifax Formations, may exceed 10 km in thickness and Schenk (1970) has interpreted the group as a eugeosynclinal-flysch facies.

The basal part of the Meguma Group is the Upper Cambrian (age uncertain) Goldenville Formation which has a minimum thickness of 5500 m (Sangster, 1990). Lithologically it consists of massive, thick bedded, sandy flysch with thinly interbedded (0.1 to 2 m thick) chloritic slate and siltstone. The overlying Halifax Formation, of Ordovician age, is approximately 3700 m thick and consists of grey to black slate with thin interbeds of flysch. The slate beds are commonly carbonaceous and contain several percent of pyrrhotite, with minor pyrite in the coarser grained and less carbonaceous beds.

The transition between the two formations of the Meguma Group consists of interstratified slate and sandstone and is intermittently exposed over a

strike extent of 1700 km in Nova Scotia. It represents a change from the non-carbonaceous sulphide-poor rocks of the Goldenville Formation to the carbonaceous and sulphide-rich rocks of the Halifax formation. The transition zone is characterized by an enrichment in Mn in a distinctive and widespread calcareous argillite unit. This unit, referred to as the coticule (spessartine-rich quartzite) horizon, is locally anomalous in Zn, Pb, Ba, As and Au (Sangster, 1990).

The Meguma Group metasediments are intruded by peraluminous granodiorite-monzogranite complexes ranging in size from bodies of several square kilometres to composite intrusions of batholithic scale. Aplite and pegmatite dykes are indicative of a later magmatic phase.

Regional metamorphism, associated with the earliest Acadian plutonism, postdated the development of regional folding (Keppie, 1985). Regional metamorphic grade is typically greenschist facies but local areas of higher grade are present.

The Meguma Group rocks have been extensively affected by both brittle and ductile faulting. The northeast-trending Acadian folds are offset by a northwest-trending sinistral fault system. Fyson (1966) reports "at least three generation of folds and faults."

Sangster (1990) documents three fundamental classes of mineral occurrences in the Meguma Group rocks as follows:

Class 1: Concordant deposits that formed during sedimentation or diagenesis (Eastville)

Class 2: The structurally controlled gold deposits of hydrothermal origin (the Meguma Au deposits)

Class 3: Deposits related spatially and genetically to the plutons (Duck Pond Sn)

To this must be added the vein type auriferous antimony/tungsten deposits noted above and which also are probably closely related to the granites.

5.6 DEPOSIT GEOLOGY

Low physical relief and bogland in the Eastville area result in poor bedrock exposure outside the few deeply incised brooks. Thus the local geology has been determined from interpretation of data from drilling and geophysical surveys. The basal Goldenville Formation comprises three main lithological units (Fig. 19) which Binney et al. (1986) describe as a massive quartz metawacke (+30 m thick) passing upward through a transition zone (30-35 m) into a calcareous quartzite (7-10 m), which is the "coticule" horizon of Sangster (1990). Overlying this is the essentially black slate of the Halifax Formation which is >150 m thick in the Eastville area.

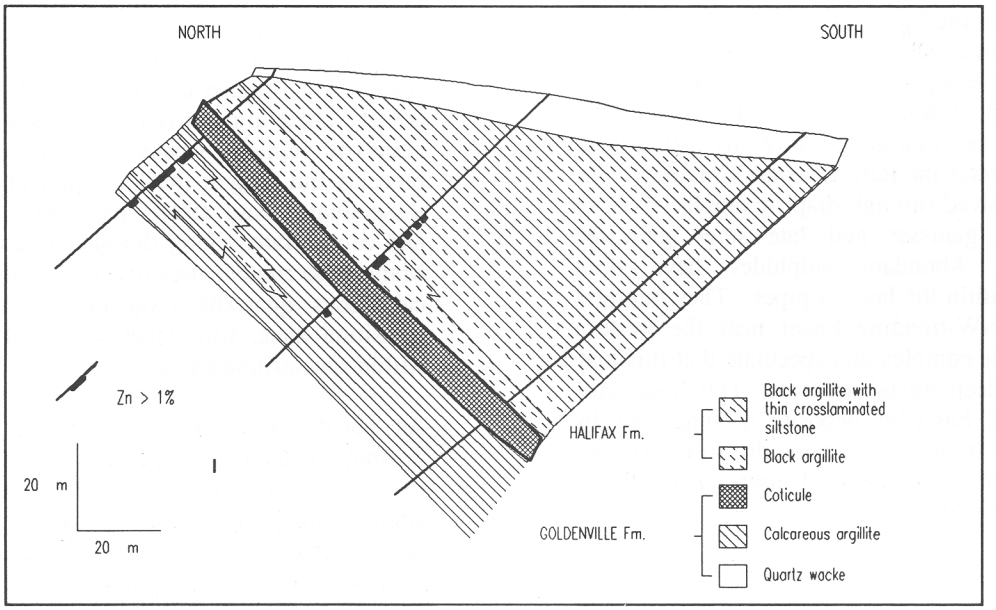

Figure 19. *Eastville deposit - vertical section (after Binney et al., 1986).*

Binney notes that the units defined in drill core have not been recognized in outcrop and only the gross division between the Goldenville and Halifax Formations can be mapped. The distinctive 'coticule' horizon comprises interbedded quartz metawacke, calcareous quartz metawacke and black slate, and the highly contorted bedding and anomalous Mn content are regarded as diagnostic. Pyrrhotite is a major component of this horizon comprising more than 10% by volume. The Halifax Formation, comprising black graphitic slate with quartz metawacke interbeds, stratigraphically overlies the Goldenville Formation in all drillholes. Sedimentary features, Bouma sequences and load casts, indicate that the quartz metawacke beds were deposited from turbidity currents. This stratigraphic assemblage is consistent throughout the area, having been traced over 10 km of strike length by drilling.

The Eastville area is on the northern limb of a large ENE-trending syncline in the Meguma Group. The Goldenville/Halifax contact dips 45^{o} to 80^{o} to the south in the western exposures. To the east attitudes are vertical and locally are overturned and dip northwards. Two sets of steeply-dipping faults have been recognized, (Fig. 18). The first set trends 160^{o}, is sinistral and offsets the contact by 10 to 150 m, whereas the second set trends 010^{o} to 030^{o} and has larger offsets ranging from 100 to 500 m. A low angle thrust, interpreted by Binney et al. (1986) in the eastern drill section, has been offset by a later fault trending 150^{o}.

The Liscomb Pluton, of Devono-Carboniferous age, truncates the Meguma Group rocks to the east and the Halifax slates, on the north side of the intrusion, show contact metamorphic effects (Binney et al., 1986). Giles and Chatterjee (1987, a & b) have shown a greater diversity within these rocks and prefer the term Liscomb Complex. The complex evolved through diapiric emplacement of high grade genisses and late stage granitoid intrusion. Abundant sulphides have been identified within the breccia pipes. They interpret a strong NNW-trending linear near the western margin of the complex and speculate that this may represent a deep crustal structure. This linear cuts through the Eastville deposit, is supported by geochemical trends in the same direction (Rogers, 1989), and may be genetically associated with the Eastville mineralization.

5.7 MINERALIZATION

In the five year period 1977-82, twenty-eight diamond-drill holes totaling 3896 m were drilled to investigate the Eastville deposit. These holes were drilled over a 10 km strike length in three zones, the East, West and House zones as indicated in Figure 18.

Binney et al. (1986) identify the following suite of sulphide minerals in decreasing order of abundance: pyrrhotite, pyrite, sphalerite, galena, chalcopyrite and arsenopyrite. Textural evidence (Jenner, 1982) suggests that much of the pyrrhotite was originally deposited as pyrite. Sphalerite and galena occur both as discrete mineral grains or intergrowths with each other and as replacement grains in pyrrhotite. Chalcopyrite occurs in pyrrhotite or sphalerite and arseropyrite has been observed at only a few locations in veins in the calcareous quartzite member (Binney et al., 1986).

Two principal styles of sulphide occurrence, conformable and replacement, have been observed, with the conformable style being the more abundant. Stokes (1986; and Stokes and Zentilli, 1987) has analysed the distribution of the sulphides and confirmed that bedding sulphides account for 70-80% of the sulphides present. Pyrrhotite is by far (80%) the most abundant and grades vary with lithology, ranging from 3-10% sulphide content in the slates to <1-2% in the quartz metawacke. Stokes did not observe disseminated sphalerite or galena macroscopically, though both Jenner (1982) and Binney et al. (1986) recognized both sulphides microscopically. Stokes also quantified a definite correlation between the number of sphalerite-galena-calcite fractures and higher combined Zn-Pb grades (0.5-0.8%). These mineralized fracture systems include veins or veinlets, stockworks and cross-cutting breccias and suggest that the lower grade (<0.5%) disseminated base metals have been remobilized and concentrated along the later fracture systems. Manganese content rises to a maximum within the calcareous quartzite (coticule) member of the transition zone, with most of the Mn occurring within spessaritine garnets.

As noted above, mineralization is present in drillholes extending over a strike length of 10 km. In the Western zone the dip is 50^{o} to south and the stratigraphic succession is complete. Much more faulting is evident in the East zone and the beds are overturned and dip steeply northwards.

The mineralization extends over a stratigraphic interval of 100 m and most drillholes include sections running 1-3% combined Zn-Pb over 2-10 m. Better grades are present, e.g. 3.34% Zn+Pb /6m in Hole 7; 4.09% Zn + Pb /9.33m in hole 28 (including 6.51% Zn + Pb /2.13 m); 2.61% Zn + Pb in hole 26; and 2.19% Zn + Pb /19.8m in hole 11. The higher grades occur in the more faulted Eastern zone. Silver values occur and a 0.6 m section in DDH 28 which assayed 7% Zn carried 0.5 oz. Ag/t.

5.8 EXPLORATION POTENTIAL

Eastville is the best documented base metal sulphide deposit in the Meguma Group rocks of Nova Scotia. The much better known gold deposits have very local development of massive sulphides but nowhere does the base metal content approach the grades found at Eastville. Smith (1985) reports that a hole drilled 1.3 km northwest of the West Gore antimony mine intersected 536 m of thinly laminated Halifax Formation argillites below 110 m of Horton Group clastics. Within these argillites he reports "unusually high combined sulphide content (5 - 15%)" and notes that "similar sulphide concentrations elsewhere in the province commonly occur near ore-bearing horizons." Heavy sulphides, mainly pyrite, are also associated with the gold deposits at Cochrane Hill.

The Eastville deposit is laterally extensive, having been indicated over a 10 km strike length, but has been investigated by only 28 drillholes. The base metal sulphides are stratigraphically restricted over a 100 m section at the transition zone between the Goldenville and Halifax Formations. No volcanic rocks have been recognized in the sequence.

Binney et al. (1986) conclude that the Eastville deposit is a sediment-hosted stratabound Pb-Zn deposit as defined by Morganti (1981) and Large (1983). The independant distribution of iron and zinc and lead, the overall stratiform nature of the deposit and the affinity of the base metal sulphides for the graphitic black shale support this conclusion. Binney et al. (1986) did not identify any marginal graben feeder structures as the source for the base metals and suggest that the deposit is distal to the exhalative vent area. Though attempts have been made (Zentilli et al., 1984) to relate the anomalous Mn content in the transition zone coticule horizon with the base metals, Binney et al. (1986) note that the zinc and lead mineralization occurs stratigraphically above or below the high Mn horizon.

It should be noted that a major structural NWW trend marks the western side of the Liscomb Complex of Giles and Chatterjee (1987b) and such a major feature may have caused geothermal gradients and metalliferous solution to issue into the Meguma sediments. The fact that three separate zones of higher grade have been identified over the 10 km strike length may suggest that the factors responsible for remobilizing the mineralization into ore may very well trend in a direction at right angles to the regional strike.

Sangster (1990) notes that though the Mn horizon at the transition between the Goldenville and Halifax formations is a regional feature in Nova Scotia, significant levels of base metal enhancement have only been reached at Eastville. He concludes that this indicates that the mineralizing processes were local rather than regional. He quotes lead isotopic data which suggest similarities with the Bathurst and Stirling deposits and concludes that "it is compatible with a sedimentary exhalative origin in the Meguma rocks."

Sangster (1990) also draws analogies with the Aguilar exhalative Zn-Pb-Ag deposit in NW Argentia and notes that the stratigraphic setting is similar, as are sulphur and lead isotope data.

It would appear that the potential of the Meguma Zone for base metals has not been seriously tested and it is suggested that a renewed search along this 1700 km contact in Nova Scotia may well be warranted.