The Esperanza porphyry Cu-Au deposit is located approximately 60 km south of Calama, in the porphyry copper province of northern Chile. Although partly exposed, historically mined from small-scale pits, and intermittently explored by several major companies between 1983 and 1992, its true size and potential were appreciated by Anaconda Chile S.A. only in 1999. Discovery was the direct result of detailed geological mapping of key rock types, hydrothermal alteration assemblages and zoning, and was partly underpinned by a property-wide ground magnetic survey. A total of 25,700 m were drilled between 1999 and 2001 and, by June 2001, a geological resource of 71 Mt @ 0.42%CuT (oxides) and 443 Mt @ 0.63%Cu and 0.26g/tAu (sulfides) had been estimated using a 0.3%Cu cut-off grade. This sulfide resource also includes a higher-grade core of 128 Mt @ 0.98%Cu, 0.48g/tAu and 3.5g/tAg.

The geology of the region is typical of the Cordillera de Domeyko and includes several, fault-controlled basement blocks of plutonic and volcanic rocks of Late Paleozoic age and a number of sedimentary and volcano-sedimentary sequences of Mesozoic and Cenozoic age. Of these, the Late Cretaceous Quebrada Mala Fm and the middle Eocene domes of the Estratos de Cerro Casado are widely distributed in the area. Much of the region is mantled by various units of moderately to weakly consolidated gravels of late Eocene(? ) to Miocene age collectively grouped as the Tambores Fm. The regional structure is dominated by several NNE-trending splays of the Domeyko Fault System which display evidence for both strike-slip and reverse movements and exert a strong control on the location of the Esperanza system. The deposit is part of a NE-trending corridor of middle Eocene porphyry systems that, in addition to Esperanza, includes Telégrafo, Centinela, and Polo Sur. At Esperanza, a series of discrete, structurally controlled, medium-grained porphyritic dikes and small stocks of granodioritic composition intrude a sequence of massive andesite flows with interbedded pyroclastic and calcareous sedimentary horizons of the Quebrada Mala Fm. Hydrothermal alteration is typical of porphyry-type deposits and includes a potassic core overprinted and/or surrounded by intermediate argillic, phyllic, and propylitic assemblages. Early, biotite-rich alteration from the central potassic alteration yields an $^{40}$Ar-$^{39}$Ar age of 41.3±0.3 Ma.

Hypogene copper-gold mineralization occurs as chalcopyrite and bornite contained in multiple-event stockworks of quartz, K-feldspar, biotite, magnetite, apatite, and anhydrite, which are spatially and genetically associated with the potassic core. Overprinted intermediate argillic assemblages are characterized by chlorite, smectite, chalcopyrite and pyrite, whereas phyllic assemblages are barren of copper and dominated by disseminated and veinlet pyrite. Within the potassic core, anhydrite becomes increasingly abundant with depth and, locally, forms a large, massive body with interbedded proximal skarn assemblages rich in garnet and diopside. Supergene copper mineralization is developed in the upper 150 m of the deposit where it is characterized by atacamite and chrysocolla, with subordinate brochantite, copper pitch, and copper-rich clays. Volumetrically minor oxide-sulfide mineralization occurs at the redox interface and defines a several-meter thick zone that, in addition to chalcopyrite, contains small amounts of chalcocite, covellite, native copper, and cuprite.

The following features define Esperanza as a classic example of the gold-rich category of porphyry copper deposits: 1) Gold grades average >0.3g/t, with a large tonnage averaging >0.4g/t; 2) Copper and gold grades display a positive correlation; 3) The bulk of the Cu-Au mineralization is contained in potassic-stable hydrothermal alteration; 4) Magnetite is a major constituent of the ore and averages >5 vol. %; 6) Gold occurs in its native form as micron-sized particles included in or attached to copper sulfide grains; 7) Presence of intermediate argillic alteration that has partly destroyed earlier-formed potassic alteration and its associated Cu-Au content; 8) Overall low Mo contents (<0.01%Mo). From a regional point of view, Esperanza confirms that Cu-Au and Cu-Mo end-members of the porphyry clan coexist in continental arcs within the same metallogenic belt.