The Palaeoproterozoic Yerrida, Bryah, and Padbury Basins are located on the northern margin of the Archean Yilgarn Craton. Mineralization within these basins dominantly occurs as epigenetic gold deposits (Peak Hill, Fortnum, and Horseshoe mining centers) with lesser VHMS (Horseshoe Lights and DeGrussa) and epithermal copper (Thaduna).

The DeGrussa Cu-Au-Ag volcanic-hosted massive sulfide (VHMS) deposit is located in the Narracoota Formation, the lowest mafic volcanic unit of the Bryah Basin. The deposit consists of four ore lodes (DeGrussa, Conductor 1, Conductor 4, and Conductor 5), cut and separated from each other by two large faults, with a combined strike length of 800 m and estimated resource of 14.33Mt @ 4.6% Cu and 1.6g/t Au. DeGrussa is hosted in turbiditic sedimentary rocks and basalts and intrusive dolerite units of the Narracoota Formation. The contacts of the ore deposit are typically associated with chlorite schist and a talc-carbonate exhalite unit. Sulfides are massive and fine grained consisting of pyrite, chalcopyrite, and pyrrhotite with lesser sphalerite, galena, marcasite, magnetite, and molybdenite. Chalcocite forms the main copper-bearing mineral, along with malachite, azurite, chrysocolla, cuprite, and native copper in the supergene ore zone. Greenschist facies metamorphism has affected the rocks.

A number of geochronological techniques were employed in order to date mineralization of the DeGrussa mine including rhenium-osmium (Re-Os) on molybdenite, Pb isotopes on galena and pyrite, and U-Pb on zircon. Re-Os geochronology of molybdenite resulted in two primary depositional ages of 2027±7 Ma and 2011-2013±7 Ma (DeGrussa, Conductor 1, and Conductor 4) correlating to Pb-Pb model ages on galena between 2030-2040±50 Ma (DeGrussa and Conductor 5). U-Pb on zircons on dolerites within the mine sequence provided concurrent ages of 1991-2003±7 Ma with regional intrusive granodiorite rocks providing ages of 2012-2018±10 Ma. Remobilization of DeGrussa sulfides is exemplified by Re-Os ages of pyrrhotite at 1982-1984±8 Ma and Pb-Pb pyrite ages of 1980±30 Ma.

Unlike prior studies, the Stacey-Kramer Pb evolution model was used to determine Pb model ages. The alternative Cumming-Richard model has been used to determine deposit ages across the Capricorn Orogen region tends to underestimate the age by approximately 100 Ma when compared to the Re-Os ages. Re-calculation of epigenetic and VHMS mineralization across the basins using the Stacey-Kramer model provides the following ages: Horseshoe Lights VHMS 1985-2000±35 Ma, Nathans 1652±30 Ma, Peak Hill 1890-2110±30 Ma, Horseshoe/Belltop 1995±30 Ma,
Mikhaburra 1945 Ma, and Labouchere 1830±30 Ma. These new ages coincide with major orogenic events in the region: the Glenburgh from 2005-1960 Ma (DeGrussa, Horseshoe Lights, Peak Hill, Horseshoe/Belltop, Mikhaburra), Capricorn from 1830-1780 Ma (Labouchere, Peak Hill), Mangarooon from 1690-1620 Ma (Nathans, Fortnum), and the Mutherbukin from 1280-1250 Ma (Thaduna).