

# SEG 2024 Conference: Sustainable Mineral Exploration and Development

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## The World-Class Dolphin W Deposit, King Island, Tasmania – Exploration Tools and Infrared Spectroscopy

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Tasmania is well-endowed with tungsten (W), hosting ~26% of Australia's W resources distributed across several Devonian to Early Carboniferous granite-related Sn-W deposits. King Island, in the northwest Tasmania, hosts world-class W deposits near the town of Grassy. The premining resource for the Dolphin and Bold Head deposits has been defined as 23.8 Mt with 0.66% WO<sub>3</sub>.

Given the encouraging exploration outcomes from recent drilling at the West targets on the western flank of the Sandblow Granodiorite and the return of mine operations at Dolphin in 2023, we have completed a systematic study to better constrain the geology, alteration, and mineralization of Dolphin, and to provide insights into the characteristics of West targets. The study was supported by systematic description, logging and sampling of diamond drill core from Dolphin and the West targets, and acquisition of HyLogger3 spectral data and short-wave ultraviolet (UV) images of selected samples. Geological domains for the skarn system and the correlation with the Grassy Group stratigraphy have been defined based on geological sections, 3D interpretations, infrared spectroscopy, and paragenetic investigations.

Following the development of biotite hornfels and spectacular early-stage barren reaction skarn at Dolphin, magmatic-hydrothermal fluids from the Early Carboniferous Sandblow Granodiorite pluton interacted with reactive carbonate-rich rocks from the Grassy Group, producing a prograde infiltration skarn assemblage containing andradite, hedenbergite-diopside, and the first stage of scheelite mineralization, which was Mo-rich (up to 8%). Retrograde skarn contains calcite with a strong pink UV fluorescence and a second mineralization stage defined by molybdenum-poor scheelite, along with epidote, chlorite and amphibole gangue. Late-stage hydrothermal processes produced calcite-ankerite and quartz veins, and minor sulfides (molybdenite, sphalerite, chalcopyrite, pyrite and pyrrhotite). A similar paragenesis has occurred at the West targets, but hornfels and reaction skarn are more common than infiltration and retrograde skarn, in contrast to Dolphin.