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The impact of physical and geomechanical rock properties on fluid flow in Sandstone Reservoirs: Taranaki Basin, NZ

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Around the world, extensive work has been undertaken to understand the geomechanical properties of sands and shales, for application to the modelling of petroleum reservoirs. Geomechanics provides vital information on the in-situ stresses within a basin, including rock stability and rock strength. The geomechanical properties of a reservoir, when combined with the petrophysical properties of the rock, will have a direct impact on reservoir stability and the potential for fluid to flow through it.

This study focuses on the petroleum producing Maui-Maari Region, in the Southern Taranaki Basin, New Zealand. Despite development in the resources hosted here, an absence of geomechanical data for the region means industry relies on non-site specific geomechanical properties, for stress field calculations. This has downstream implications for any decisions that need to be made on well design and field planning. In turn, no research has been undertaken, in Taranaki Reservoirs, linking the well-studied petrophysical rock properties, to the poorly constrained geomechanical rock properties. For this section of the study, data is sourced from outcropping Paleocene-Eocene Reservoirs.

Laboratory testing is used to quantify the geomechanical rock properties of key reservoir horizons in the basin, including porosity, permeability, density, elastic wave velocities, and uniaxial compressive strength. In-depth investigation of the petrophysical and microstructural properties provides an insight into the role the rock fabric plays on the geomechanical behaviour and its control on the ability of fluid to flow.
Understanding of the interconnection between the properties is essential to develop meaningful predictions, when extrapolating from laboratory results up to wireline or field wide geophysical scales.