Wellbore instability has been a problem for operating companies for decades as it costs more than six billion USD annually. Most of wellbore failure occurs during drilling operations and particularly in shale formations. Shale has been an issue for many drilling operators whereas 90% of the borehole collapse problems are related to shale instability issues. In general, wellbore stability analysis is a complicated task that might require a highly specialized consultancy and it is a time consuming process. Simplifying the wellbore stability analysis in a form that makes it easy and ready to apply directly by drilling engineers is an essential need which is missed in the oil and gas industry.

Therefore, a geomechanical study was conducted in advance for the purpose of calculating the most suitable mud density and borehole trajectory before drilling a well. There are several models in the industry to do these analyses; however, they require knowledge of running the software or program to reach the responses. Conducting a geomechanical study for one field may costs a lot in the oil and gas industry. Therefore, simple application of the model is necessary which can be available and reachable with no requirement of geomechanical software. The applied model was transformed to several stability charts that are reachable for all drilling engineers and operators. The used stability charts were based on Mogi-Coulomb failure criterion which is a 3D analytical model that considers the effect of the intermediate principal stress, \( \sigma_2 \).

The stability charts provide the minimum allowable mud density to prevent borehole collapse for shale formations at several borehole inclinations and azimuths. The charts were specified for some ranges of parameters since they are mainly focused on the shale formations of Oman. They were categorized based on these parameters whereby every parameter represents a subcategory for the sake of organization. The effect of each parameter was studied individually to identify some relationships among them whereas an additional value is added to the research.

The developed charts were applied for real field data that cover shale formations worldwide and in Oman, specifically. There was a strong agreement between the applied mud density and the predicted one from the charts. The corresponding results outweigh the usage of stability charts to diminish the borehole instability issues represented by borehole collapse.