Location	Time In	Time Out	Objectives
Starting Point	7:15	7:30	HSE and Field Trip Briefing
Stop 1	7:45	8:30	Overview of faults and fractures in Carbonate Rservoirs
Stop 2	8:45	9:15	Sand Dunes in Muscat - Analogue to aeolian petroleum reservoirs
Stop 3 (Optional)	9:30	10:30	Overview of the geology in Muscat from the Ghala Village
Stop 4	11:00	12:00	Hammam Ali Hot Spring and the contact between the Ophiolite and the Triassic-Jurassic rocks
Al Khod Village	12:30	13:45	Lunch and Prayers
Stop 5	13:45	14:30	Overview of the Cenozoic deposits in the area and discuss their setting and significance
End Point		15:00	Back to the starting point
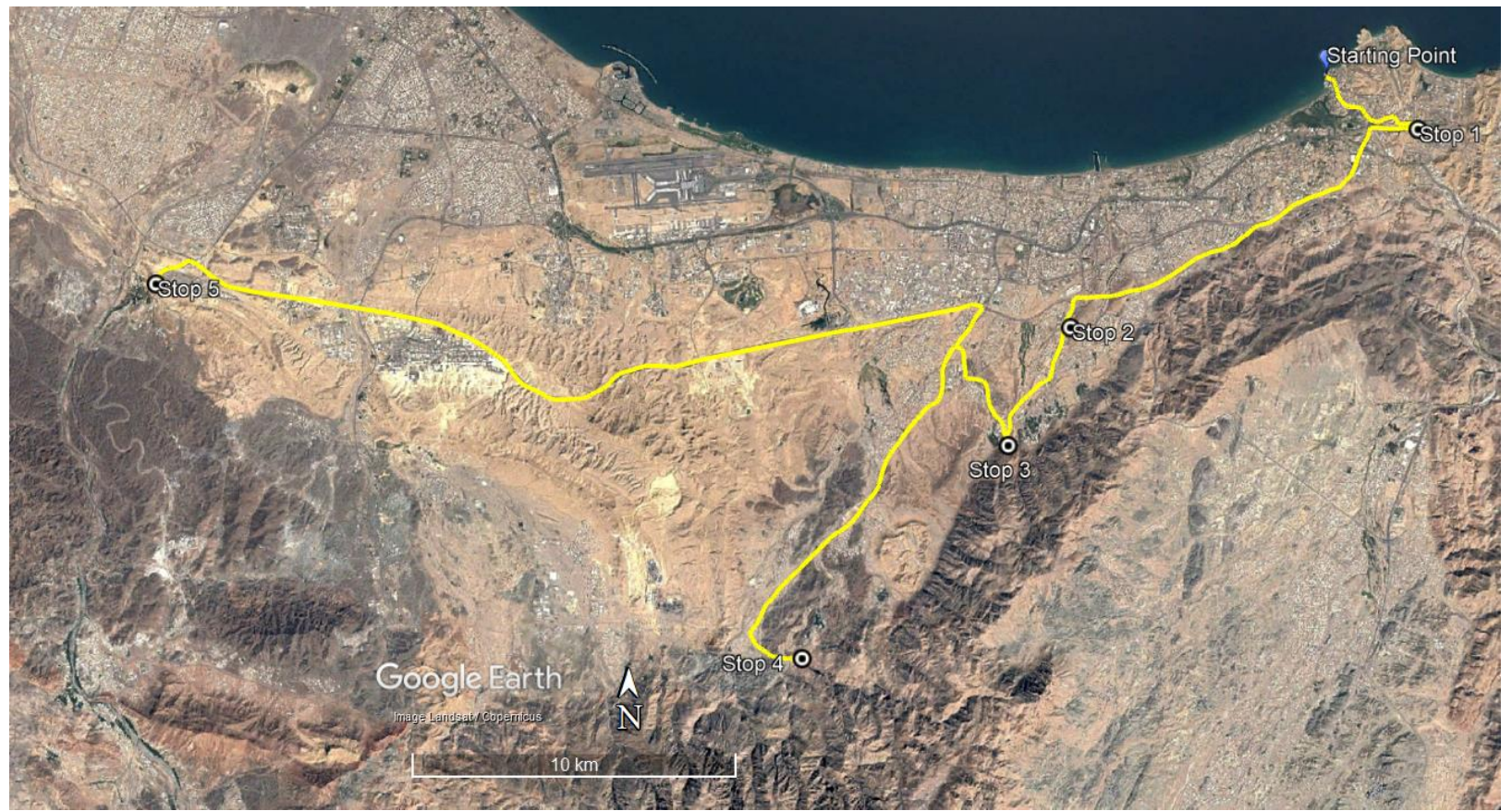
As part of the SPE Workshop: Complex Reservoir Fluids in Oman in October 2024, we will be organizing a field trip to explore outcrops of petroleum reservoirs and hydrothermal springs near Muscat. These springs hold potential for future geothermal energy development, offering a glimpse into Oman's renewable energy possibilities. This excursion will provide an excellent overview of the geology surrounding Muscat and offer key insights into the petroleum system of Oman. It's a unique opportunity to engage with experts, gain a deeper understanding of the region's subsurface geology, and explore both hydrocarbon and renewable energy prospects. **The following slides present examples from 3 stops along the field trip route.**

Stop 1

This section offers a good discussion ground about the properties of subsurface reservoirs and the importance of capturing the right level of details to model these reservoirs geologically and dynamically. It is important to analyze whether fault planes are continuous across all layers, as discontinuities may impact fluid flow and reservoir quality. The weathering profile provides valuable information about surface processes and rock alteration, which can help infer subsurface conditions. Seismic data is useful in highlighting major structures like anticlines, synclines, and faults, offering a broader view of subsurface geology. Additionally, integrating subsurface data, such as well logs and core samples, helps refine interpretations of sedimentary facies and structures. Upscaling this data into static and dynamic models at the right level of details ensures accurate reservoir simulations for production forecasting.

Stop 4

Hot springs are common at the contact of the in-situ (authochthonous) Permian-Cretaceous carbonates of the Tethyan margin and the overthrust Semail Ophiolite(e.g. Bausher, Rustaq, Nahkl, Rustaq, etc.). Hamam Al Ali has a temperature of 63-66°C. The geothermal gradient in northern Oman is 25-30°C per km i.e. that is what you would find in a borehole or a mine shaft 1 km deep added to the surface temperature (~20°C). It seems likely that the spring is due to rainfall on the jebels to the east that descends through the vuggy and fractured Permo-Triassic carbonates to depths of 1.5 km, before rising by convection ~ along the thrust fault and spilling out at the contact with the impermeable ophiolite.
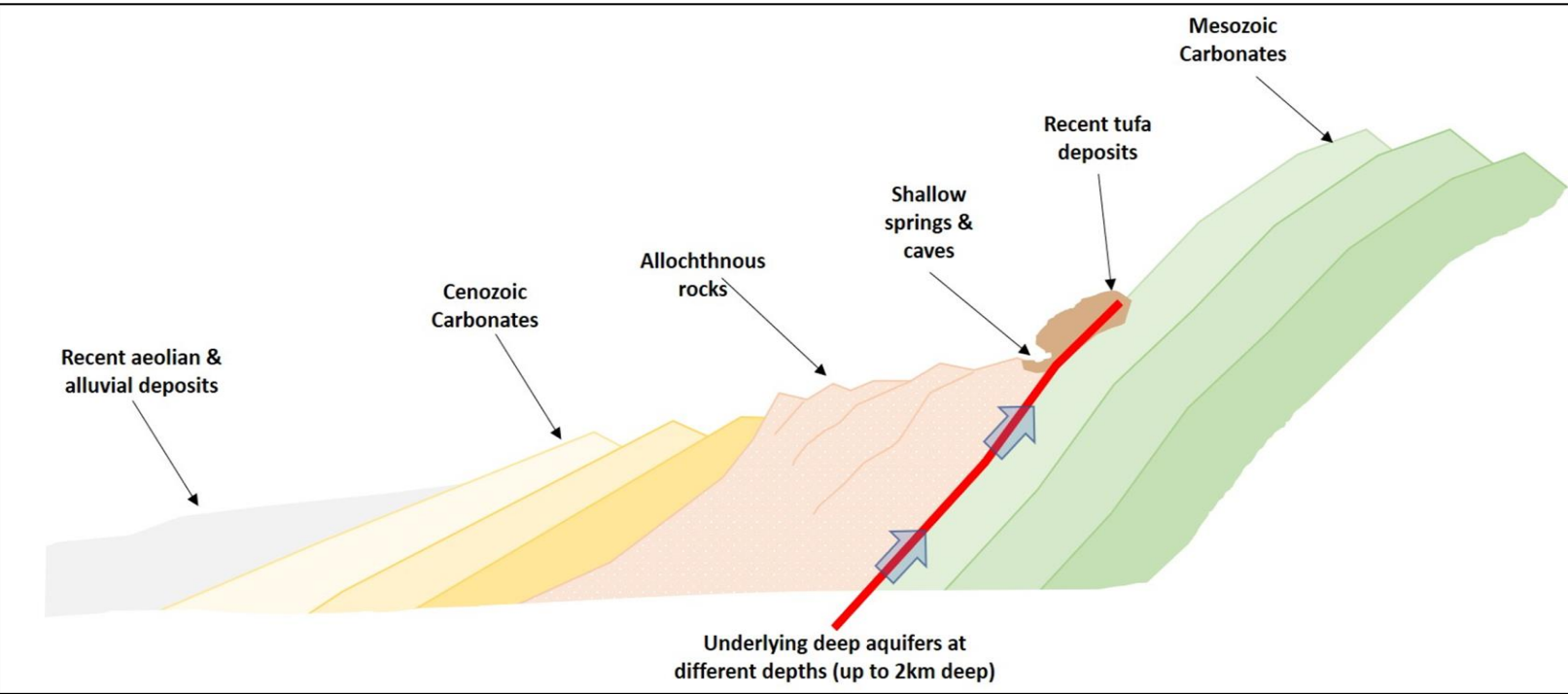
Stop 5

The Cenozoic rock section in the Al Khoud area in Muscat, of the UeR, Rus, and Dammam formations, provides significant insight into the region's geological history in recent times. These formations represent a sequence of carbonate-dominated rocks that were deposited. The UeR formation, characterized by its limestone and dolomite layers, reflects shallow marine conditions, indicative of a warm, tropical environment. The Rus formation is primarily composed of evaporites, including gypsum and anhydrite, pointing to episodes of restricted marine conditions and high evaporation rates. The Dammam formation, which overlies these layers, is rich in fossiliferous limestone, providing evidence of vibrant marine life during its deposition.

This rock section is of great importance not only for its stratigraphic value but also for its implications in understanding regional petroleum systems. Studying this section can help in understanding the diagenetic processes that have influenced reservoir quality.