With an increase in exploratory drilling activity in Colombia, different technologies and environmentally-friendly alternatives have been proposed in the Colombian drilling market. An opportunity to use a water-based mud (WBM), in an area where wells are typically drilled with oil-based muds (OBM), was presented to an operator drilling an exploratory well in the Colombian foothills. The bottomhole temperature registered at 270°F (132°C) and there was an overbalanced pressure of 1,800 psi (12.4 MPa). This was the first well drilled by the operator and also the first well drilled completely with a WBM in the zone.

Baker Hughes customized the PER-FLEX™ high-performance water-based drilling fluid system to meet the fluid objectives for the operator. The well was drilled in six sections: five were planned and one was sidetracked in a 12¼-in. hole.

The third section of the well proved to be the most challenging. In the Carboneras formation, layers of shale and sand were exposed in the same open hole, increasing the risk of wellbore stability issues and differential sticking. The section was originally drilled with a 12¼-in. bit from 11,758 ft (3584 m) to 16,919 ft (5157 m). While tripping the hole, the pipe broke and a fish was left. A sidetrack was performed to reach the planned depth of 16,945 ft (5165 m).
The original hole and the sidetrack were drilled with the PER-FLEX system to help maintain wellbore stability using its unique shale-control chemistry.

The PER-FLEX system reduced differential sticking in the low-pressure sands, enabling a high rate-of-penetration (ROP) and eliminating bit balling while drilling, in combination with a bridging strategy using LC-LUBE™ lost circulation materials (LCM) and calcium carbonate. Despite exposure to HP/HT conditions, the system maintained wellbore stability for more than 60 days. The system’s mud properties were maintained in the highly reactive shale environment.

The PER-FLEX system minimized the wellbore problems that were encountered in the intermediate section. The operator was able to drill, case, and cement the well at 18,550 ft (5654 m). The system provided a substantial cost saving compared to an OBM and lowered the environmental impact typically associated with an invert-emulsion fluid.