

Water Well Drilling Operations SME Support

Technology Description

The NAVFAC Engineering and Expeditionary Warfare Center (EXWC) is providing direct technical expertise to deployed Naval Construction Force water-well drill teams to support geotechnical and hydro-geological missions. EXWC, working with the water well drilling team from NMCB 3, provided a detailed technical report using geologic, hydrologic, vegetation, road, and topographic maps including the use of satellite images and other pertinent material to enable more informed in-country well-siting decisions to be made in areas that were difficult to obtain a clean potable water supply source. EXWC identified subsurface layers that contained contaminants as well as layers that were less advantageous for potable water extraction. As a result of EXWC's report, water well drilling efforts were redirected from high risk areas to alternative site areas resulting in savings in operational risk, labor hours, equipment time, and cost drilling unproductive wells. EXWC is also working with US Navy Water Well Drilling personnel to identify alternative water well drilling training sites allowing drilling school exercises to realistically train in areas that mimic onsite conditions in deployed locations. Analysis for this effort is in the form of a desktop survey and boots-on-the-ground to accurately select a site that is suitable for all stakeholders. See EXWC's Figure 1 for details of a typical water well design.

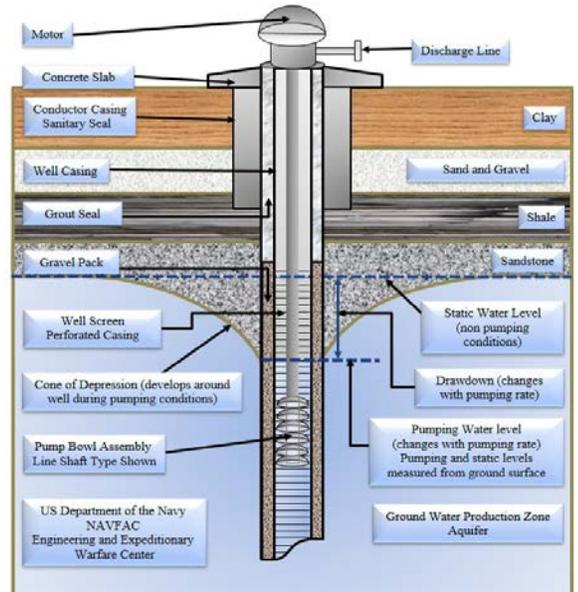


Figure 1. Water well design (Saenz, 2014).

Value to the Warfighter

EXWC is assisting the Navy water well drill team to increase levels of drilling accuracy and expediency to enhance mission readiness while reducing operational risk and training time for rapid deep well drilling missions (Figure 2).

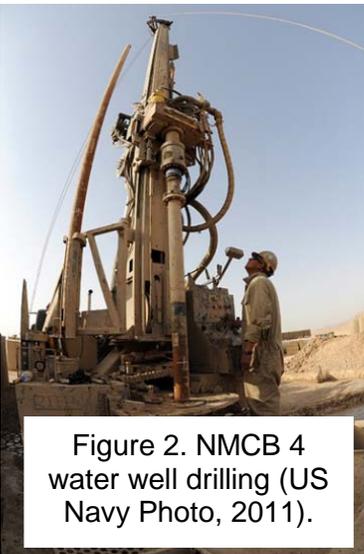


Figure 2. NMCB 4 water well drilling (US Navy Photo, 2011).

EXWC provided data also supports and facilitates other horizontal geotechnical construction tasks. Data provided enables the warfighter to better select construction sites for bridges, roads, and airfields and improves performance of these construction efforts. EXWC is also investigating providing, via NMCI approved technology, real time reach-back capability and communication with stateside expert personnel and resources such as the EXWC developed DoD Water Resource Database. The EXWC team proposes to provide real-time information and technical support to fill the capability gap in water well drilling missions resulting in a higher success rate of drilling productive wells, increased water productivity of the wells, decreased time spent in the field for surveying and drilling, reduced costs and reduced operational risk to both military and civilian personnel on the ground.

Technology Transition Documentation

The water-well support provided falls within category 5 (Warfighter Support In-Theater) of the NAVFAC Technology Usability Model.

Specific Applications

Specific applications in support of the warfighter during expeditionary water well drilling efforts will be to explore the use of NMCI and US Navy approved technologies in support of reach back capabilities. Followed

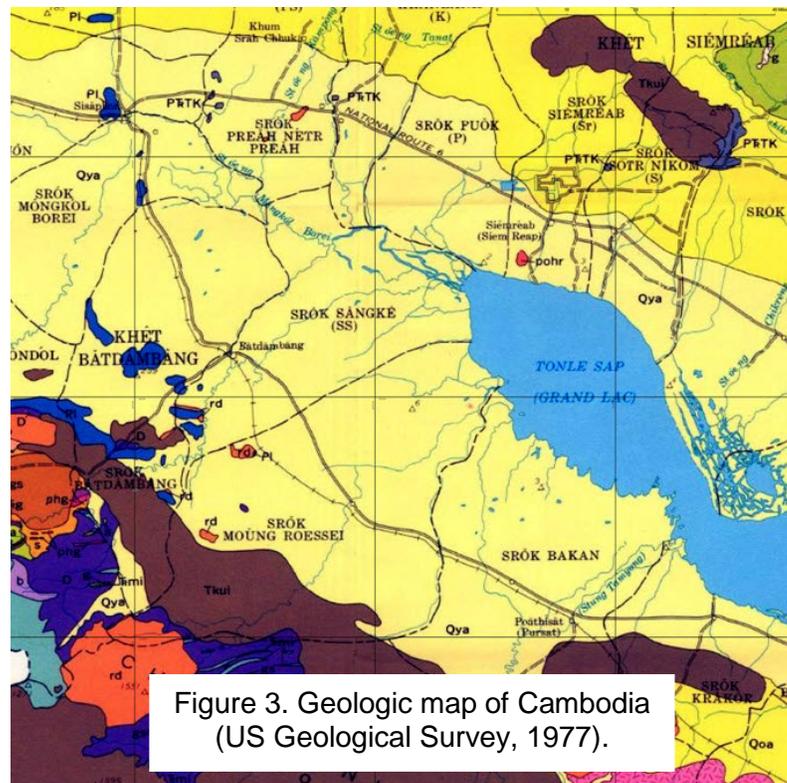


Figure 3. Geologic map of Cambodia (US Geological Survey, 1977).

by the improvement and population of the existing DoD Water Resource Database, geotechnical and hydro-geological information will be used to support the warfighter in different theaters of operations. The information in the form of satellite images, aerial photographs, geologic maps, hydrologic maps, topographic maps and other pertinent data will be used to accurately complete a site analysis (Figure 3). The computerized mapping capabilities will provide significant cost savings and minimize operational risk exposure to personnel on the ground.

All this up front analysis will be used to further recommend the use of alternative technologies such as the down-hole geophysical electric loggers that can provide a more accurate understanding of the formation penetrated by a well, the fluid in the well, and physical characteristic of the borehole. The use of alternative water drilling technologies can be expanded to the use of well drilling bits for both

soft and hard rock, including the use of alternative water well development chemicals that are phosphate free detergents that do not promote bacterial growth which attacks and corrodes steel components down hole. Finally, to explore different water well casing blank and screen types that are lightweight, durable, less prone to damage, having a higher tensile strength, less resistant to corrosion or weathering, and can easily be assembled for rapid deployment to ensure the warfighter can continue to meet goals in extreme conditions.

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