HYDROGEOLOGICAL SUPPORT TO UNITED STATES MILITARY OPERATIONS DURING THE PAST 100 YEARS

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BACKGROUND

- U.S. Military operations during past 100 years
 - Combat
 - Peacekeeping
 - Humanitarian Assistance
- Broad definition of hydrogeologist/hydrogeology
- Hydrogeology an important component
 - Water Supply
 - Excavation and Earthworks
 - Basecamp Siting
- Support to military has evolved over time

WORLD WAR I

- Lessons learned from allies' experiences
- Geologists found only at higher level headquarters
- 26th Engineering Regiment
 - Water supply unit with drilling capability
 - No geologists assigned
- 32 general and specialized reports produced
 - Groundwater supply maps
 - Impact on earthworks

Portable canvas horse watering trough in France http://mp.natlib.govt.nz Reference Number: 1/2-013577-G



WORLD WAR I

• O.E. Meinzer

- Commissioned as an Army Captain at the request of General Pershing
- Assigned as water-supply geologist at AEF HQ
- En route to France when war ended

 Three other USGS hydrogeologists joined the U.S. armed forces to support the war effort.



O.E. Meinzer, circa 1916 http://libraryphoto.cr.usgs.gov/

GROUNDWATER in WW I

"But the problems of the rocks themselves are simple compared with those connected with the presence of water in those rocks...The water-bearing strata may furnish a **desired supply for the troops** or, when cut, may cause the **flooding of extensive works**...The depth of ground water level practically determines the feasibility, or the reverse, of securing dugouts in certain areas, and of mining and sapping operations."

Whitman Cross GSA Presidential Address, December 1918



INTERWAR PERIOD

- Geologists demobilized from active service
- Efforts to highlight role of geology in support of military operations
- A.H. Brooks "The use of geology on the Western Front" USGS Professional Paper 128-D (1920)
 - Senior military geologist in WW I
 - Differences between engineers and geologists in water supply work





WORLD WAR II

- Lessons from WW I had to be relearned
- Many hydrogeologists served in uniform
- USGS Military Geology Unit established in 1942
 - Maximum of 88 geologists recruited from USGS or academia
 - Prepared terrain studies for all theaters
 - Detailed field work in European and Pacific theaters



MGU HYDROGEOLOGISTS

• D.J. Cederstrom

 "Geology and Water Resources of Southern Okinawa" (1947)

• Frank Swenson

- "Geology and Ground-water Resources of Iwo Jima" (1948)
- "Presence of enemy troops inconvenienced the work in the rougher northern part of the island."

A. Nelson Sayre

- Southwest Pacific in 1945
- Awarded the Medal of Freedom

UNIFORMED HYDROGEOLOGISTS

- Goal: one geologist per Water Supply Battalion
- Captain R.C. Baker
 - Water supply battalion in Pacific Theater
 - "An Occurrence of Saline Ground Water on Guadalcanal" (1950)

Captain W.C. Rasmussen

- Commanded water supply company that drilled more than 300 wells in Italy
- Bronze Star medal at Anzio beachhead

Major R.L. Nace

 Commanded water supply company in northern Europe



R.C. Baker GSA Memorials

MGU POST WORLD WAR II

- Most personnel returned to prewar duties
- Renamed Military Geology Branch (1949)
- Variety of projects with a Cold War focus
- Field work on Pacific Islands (1946-1956)
 - Evaluation of fresh water supplies
- Most personnel sought transfers out of MGB
 - Inability to publish classified material
 - Lack of promotion opportunities

W.C. RASMUSSEN

- WW II veteran, civilian hydrogeologist
- USAID in Vietnam: 1964-1966
- Consultant to U.S. military in Vietnam: 1966-73
 - Responsible for placement of water supply wells for troops
 - "Without exaggeration it can be said that probably every individual in the U.S. Armed Forces in Vietnam drank water from wells that he sited."
 - Killed by land mine in 1973



W.C. Rasmussen

WATER DETECTION RESPONSE TEAM

- Formed in 1985 by U.S. Army Corps of Engineers with assistance from the USGS
- Enabled military well drillers to "reach back" to hydrogeologists in U.S.
- Using WDRT assistance, well drilling units have 95% success rate in installing adequate wells



PERSIAN GULF WAR (1990-91)

- Several hundred of thousands of troops in desert
- Army Corps of Engineers
 - Pre-deployment water resources information
 - WDRT support to well drilling units
 - Created groundwater databases
 - Remote sensing used to locate wells inside Iraq
- Captain Robert Knowles conducted site reconnaissance of wells and checked water quality

AFGHANISTAN

- No designated military hydrogeologist positions
- USGS and USACE: watershed and basin scale hydrogeologic assessments
- USGS water well specification guide
- WDRT provides assistance to drillers and collects well logs for database



Conclusions

- Long history of support to U.S. military
 - Tactical to strategic levels
 - Civilians and uniformed personnel
- Nature of support evolved
 - Earthworks and water supply maps
 - Remote sensing and basin modeling
 - Long-distance support from USA
- Hydrogeology will remain important in future military operations

Questions?



Gellasch, C.A. 2012. Hydrogeological support to United States military operations, 1917–2010. In *Military Aspects of Hydrogeology*, vol. 362, ed. E. P. F. Rose and J. D. Mather. London: Geological Society. pp. 223-239