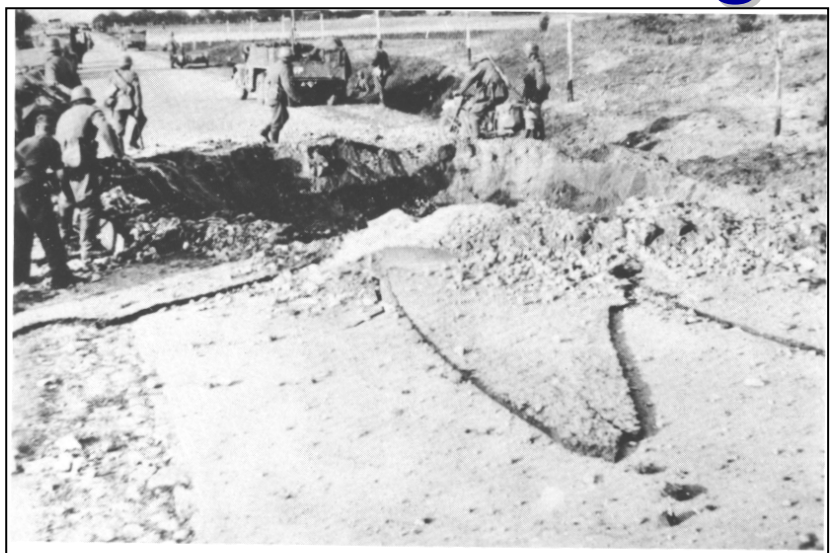
GERMAN MILITARY GEOLOGY:

BETWEEN THE WARS

BY
J. David Rogers
and
Gary Bonham

Evaluating Crater Effects



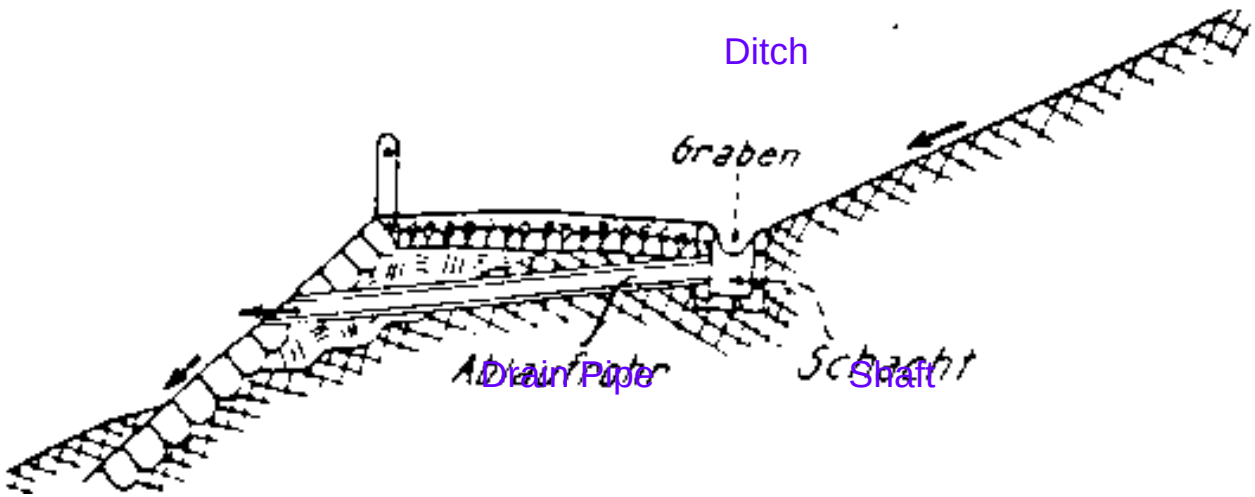
On many advance routes, bomb craters were found by the troops. Engineers were sent in at once to make the roads driveable for the following troops. September 1, 1939, the first day of the war.

A shell crater, filled with rainwater, in a road near Kure, France, in 1940.

- **Dependent on projectile, objective, rock, and the effect produced.**
- **Swamp and Moor – Deep penetration with high mud column but little damage.**
- **Drift Sand – Decreases shot effect but airborne sand = disablement.**
- **Soft loam and loamy sand – weakens burst effect, good for artillery positions.**
- **Coarse compacted sand, gravel, residual soil, firm loam and clay – full burst of projectile realized.**
- **Rock and rocky soils – intensifies burst effect and causes splintering.**

Studies of Road Stability

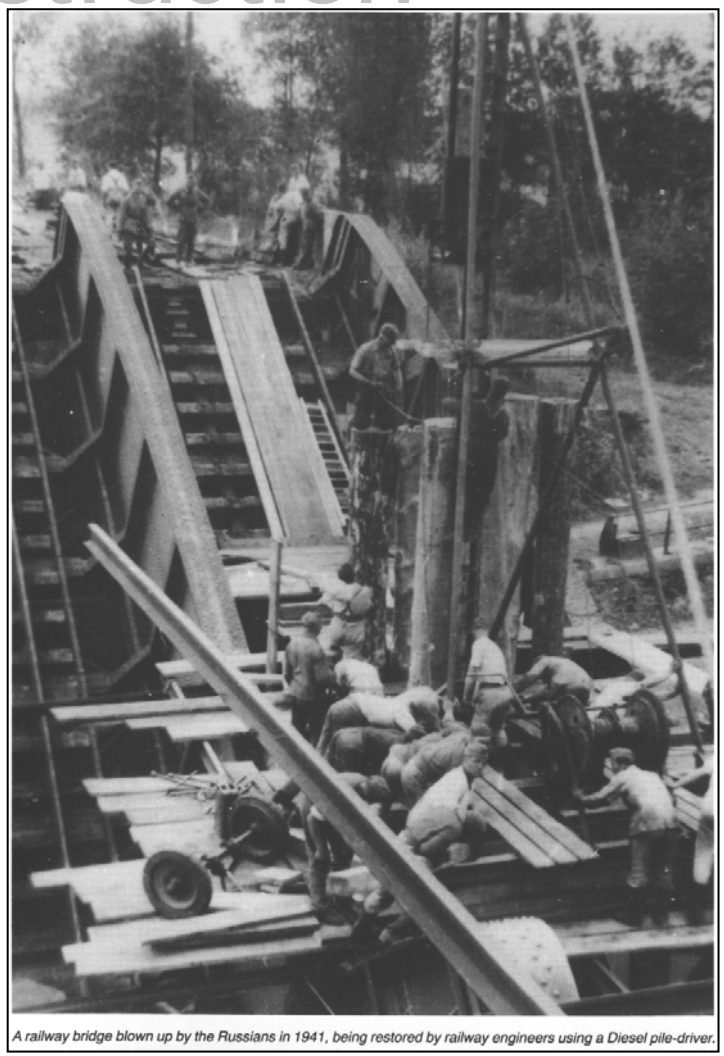
An SPW of a company of Rifle Regiment 1 of the 1st Panzer Division traverses swampy meadows in Poland in 1939. The men of Engineer Battalion 37 had their hands full making the terrain passable, using boards, fences, long and short poles.



- **Drainage issues addressed in detail.**
- **Geologists to be consulted on type of material to be used.**
- **Location of roads: underlying material, slope stability, bearing capacity, flood plains.**
- **Corduroy roads required in some instances.**

Railroad Construction

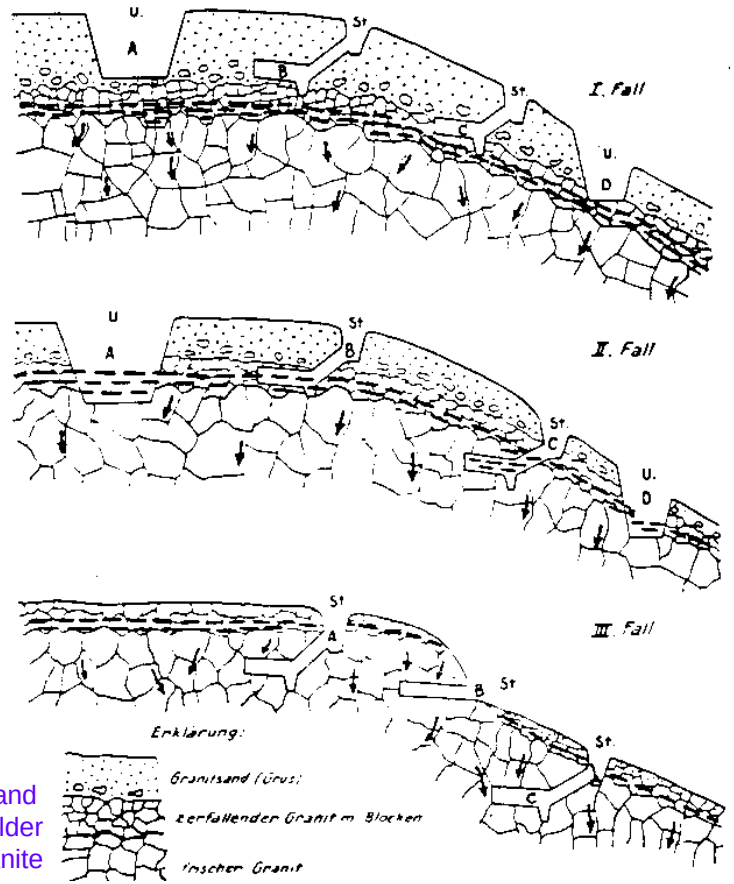
"By hand, meaning with compressed-air hammers, picks and shovels, the non-supporting rock is removed so the concrete foundation for the Roth-Wagner bridge pillars can be laid."



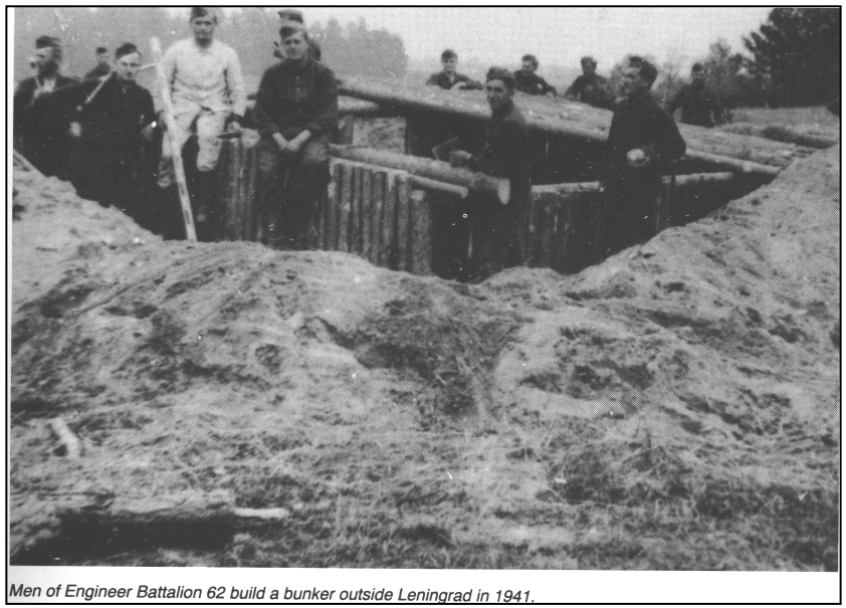
A railway bridge blown up by the Russians in 1941, being restored by railway engineers using a Diesel pile-driver.

- **Rock for railroads was preferred to be igneous and metamorphic rocks such as diabase, basalt, graywacke, quartzites, and hornestones. Limestones could be used in emergencies and all other sedimentary rocks along with granites and rhyolites were considered inadequate.**

Soils and Fortifications



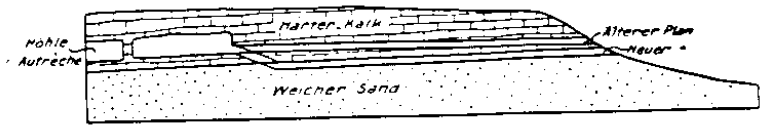
Granite Sand
DG w/boulder
Fresh Granite



Men of Engineer Battalion 62 build a bunker outside Leningrad in 1941.

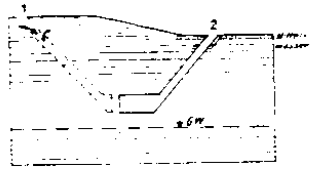
- Type of soil and/or rock must be know for design of long standing fortifications.
- Water from high groundwater tables or drainage must be planned for and dealt with.
- Loess soils have highly variable groundwater yields depending on seasons. Water seepage is problem.
- Clay soils also prone to water seepage, especially between weathered and unweathered zones.
- Granite can be wet or dry depending on weathering of the rock.

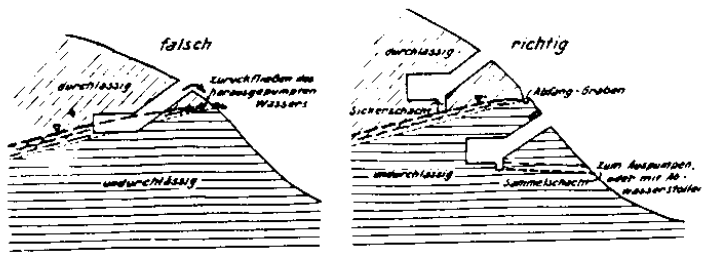
Underground Galleries



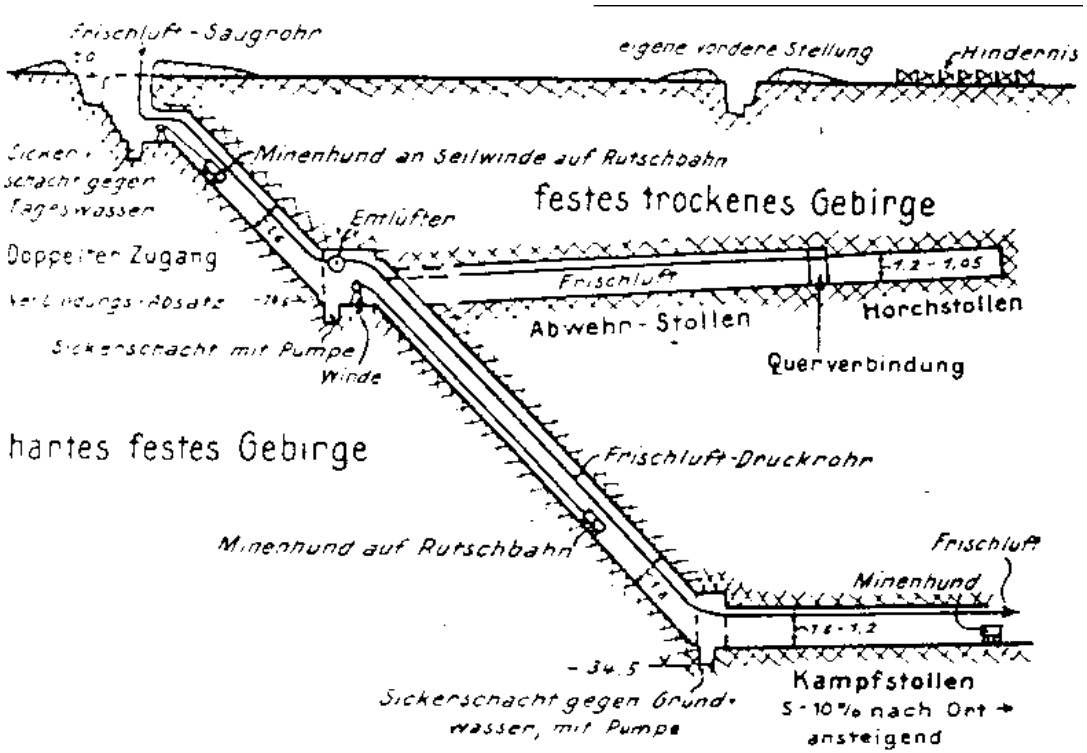
- **Victoria Gallery – Begun in the hard limestone with blasting. Moved tunnel to softer sand underneath until it reached existing limestone caves.**
- **1. Gallery will be flooded due to presence of water bearing sand.**

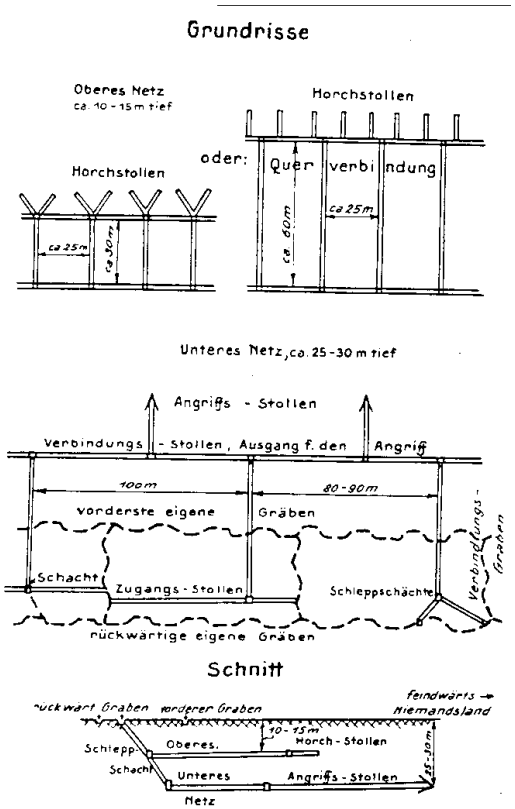
  2. Gallery will be dry due to entrance being out of water bearing sand.
- **Incorrect and correct positioning of galleries.**





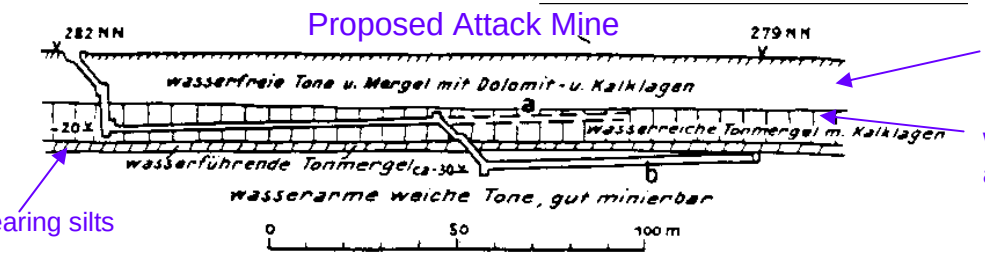
German Tunnel Systems





- **Approaches placed behind lines, hidden from enemy observation.**
- **Multiple entrances separated by distance to prevent on barrage from eliminating all entrances.**
- **Entrances must be hardened if not hidden and protected from splinters and gas.**
- **Dry rock = Inclined shafts, Wet rock = concrete or steel shafts.**
- **Cover must be sufficient to prevent damage from artillery.**
- **Listening posts placed at twice the listening distance.**
- **Number of mines based on geologic and hydrologic conditions.**

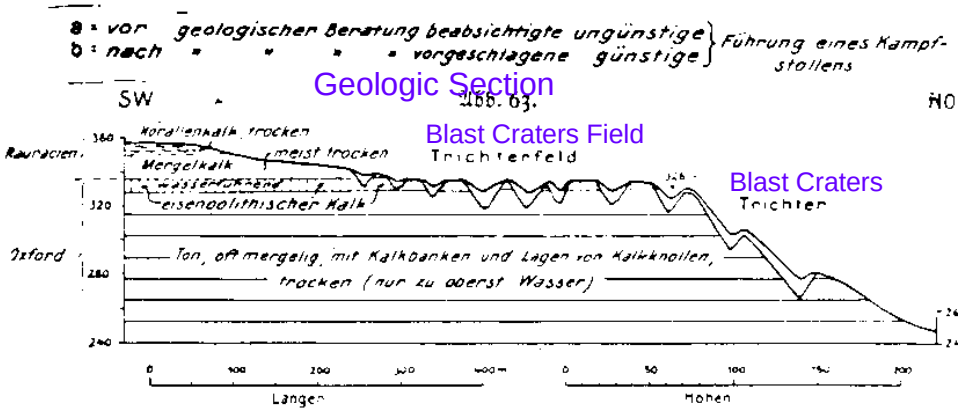
Combres Height Mines

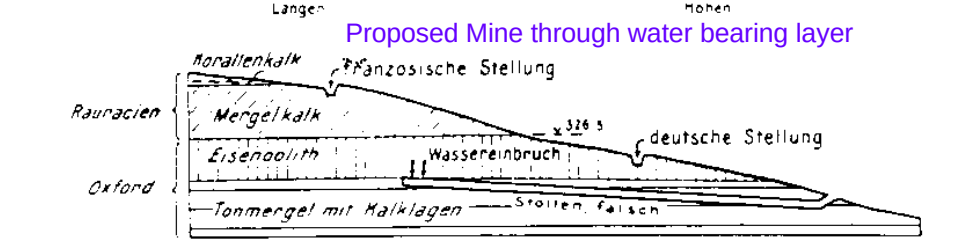


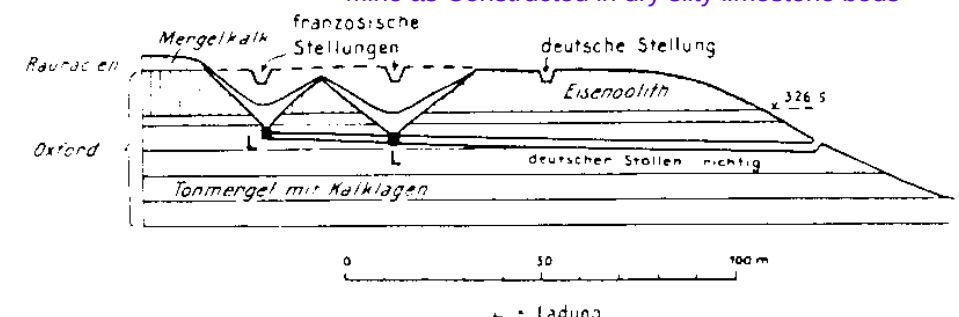
Water free silts and clays with dolomitic and limestone beds.

Water bearing silts and limestone

Water bearing silts

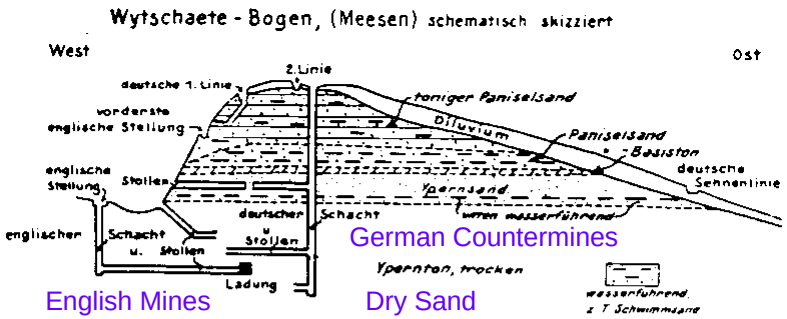






- **Begun in dry marl and water bearing iron bearing oolitic limestone.**
- **Water entered tunnels wherever tunnels passed through oolitic limestone layer.**
- **Geologists mapped section.**
- **Recommended moving attack tunnels lower into marls underlying oolitic layer where it was easier to tunnel.**

Wytschaete-Bogen Mines

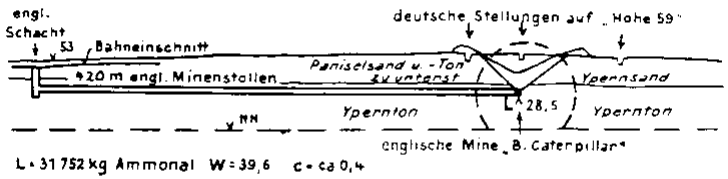


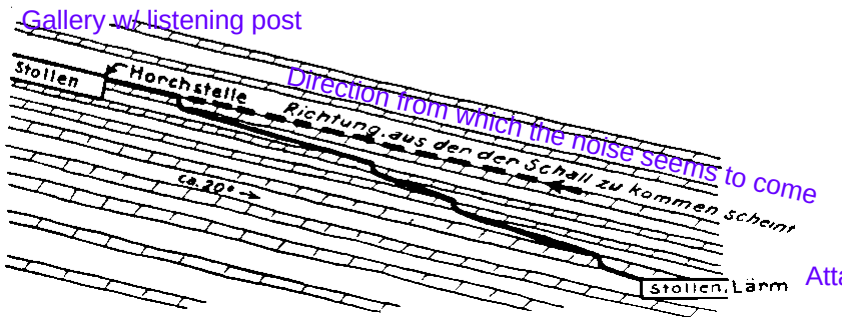
English Mines

German Countermines

Dry Sand

Water Bearing Sands





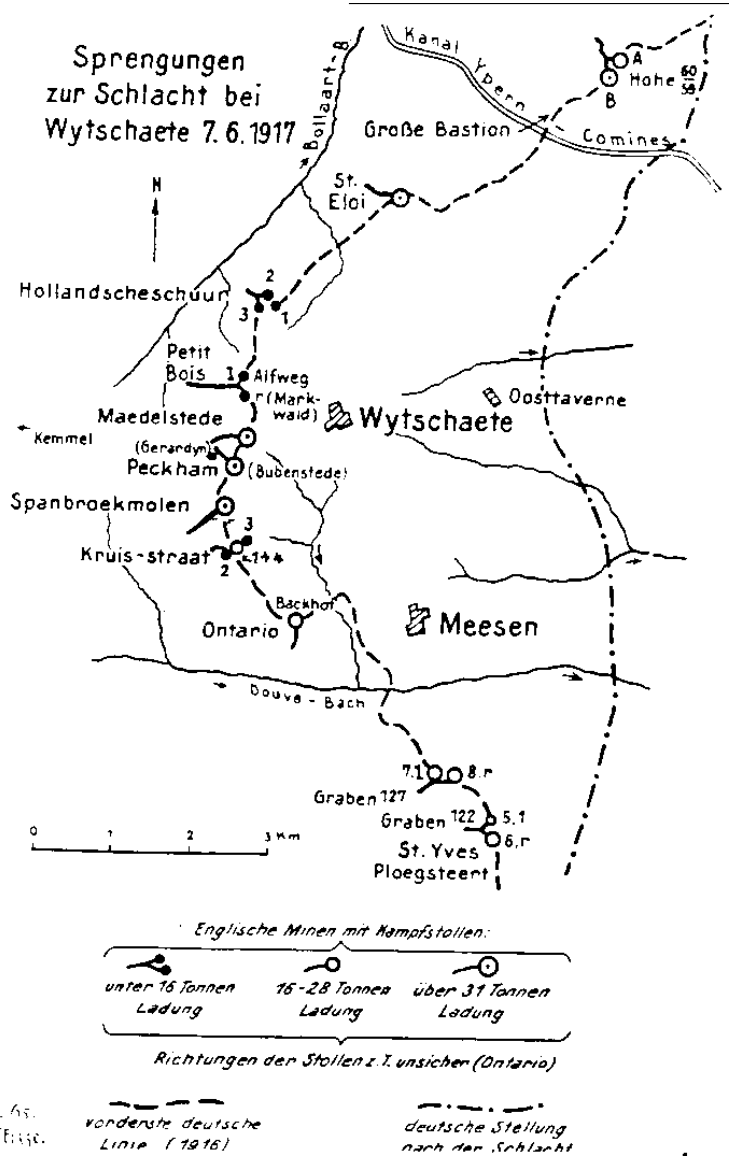
Gallery w/ listening post

Direction from which the noise seems to come

Attack Mine

- **English used two geologists to plan mines in the salient near St.Yves.**
- **Especially complex geology with several different Tertiary and Quaternary formations with separate water tables.**
- **Used shallower attack tunnels to divert German attention from deep tunnels.**
- **English fired 19 mines containing 423,000 kg of explosives helping eliminate the Wytschaete salient.**

Wytschaete-Bogen Mines



- **Map shows locations of mines in Wyschaete salient.**
- **German geologists not brought in early, advice often unheeded.**
- **Major loss of German life resulted.**

References

- **Dr. Von Bülow, Kurd., 1938, *Wehrgeologie (Military Geology);* Quelle & Meyer Publishing House, Leipzig.**
- **Riebenstahl, Horst, *German Combat Engineers in World War II: A Photo Chronicle*; Schiffer Military/Aviation History, Atglen, PA.**