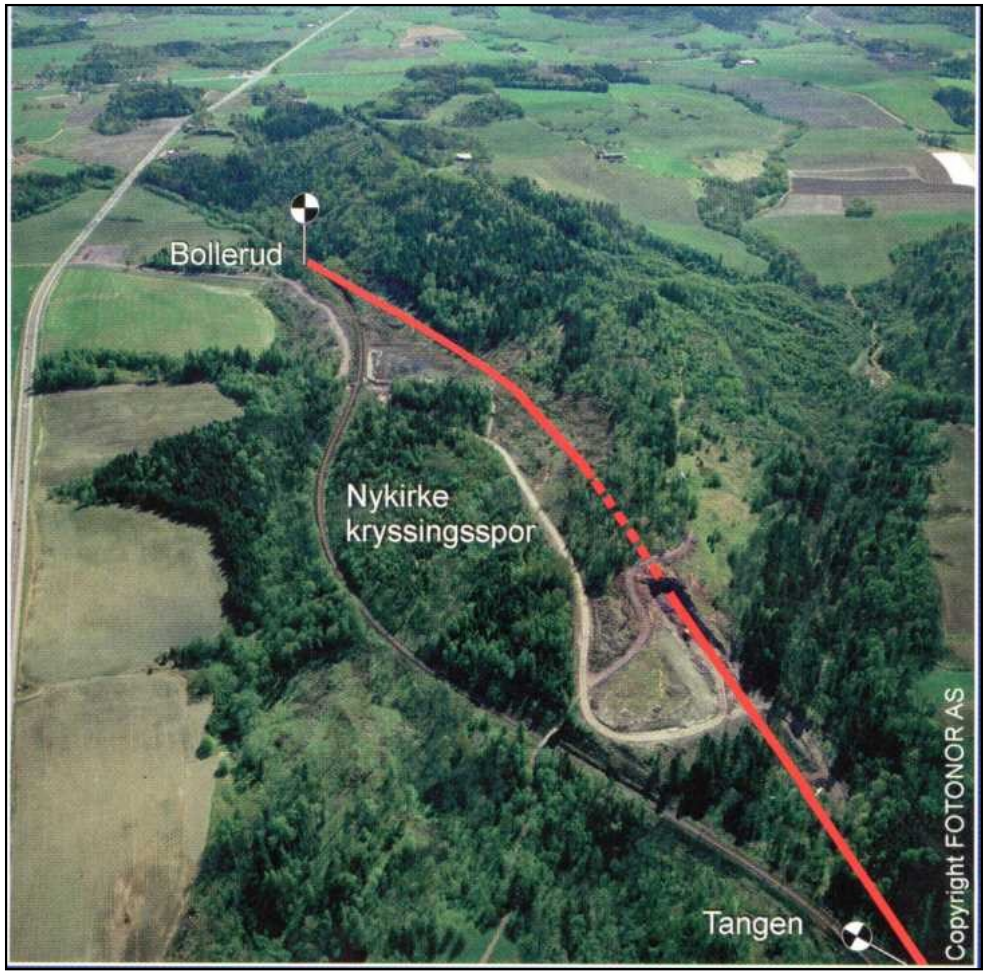
New Railway Track Nykirke, Norway

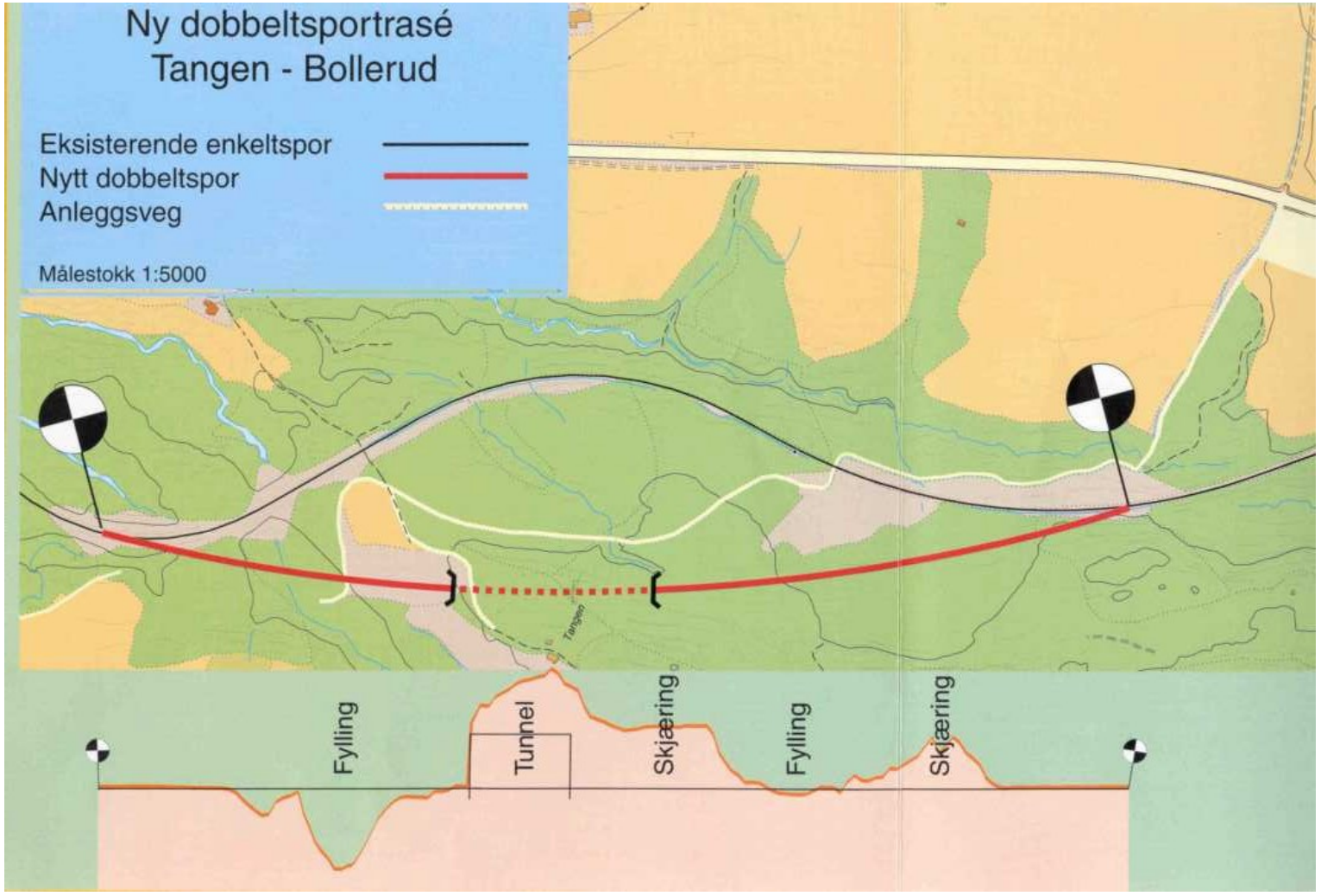
CPTU combined with block sampling resulted in cost saving solutions for new Railway link Oslo to south Norway

Steinar Hermann and Tor Georg Jensen, NGI

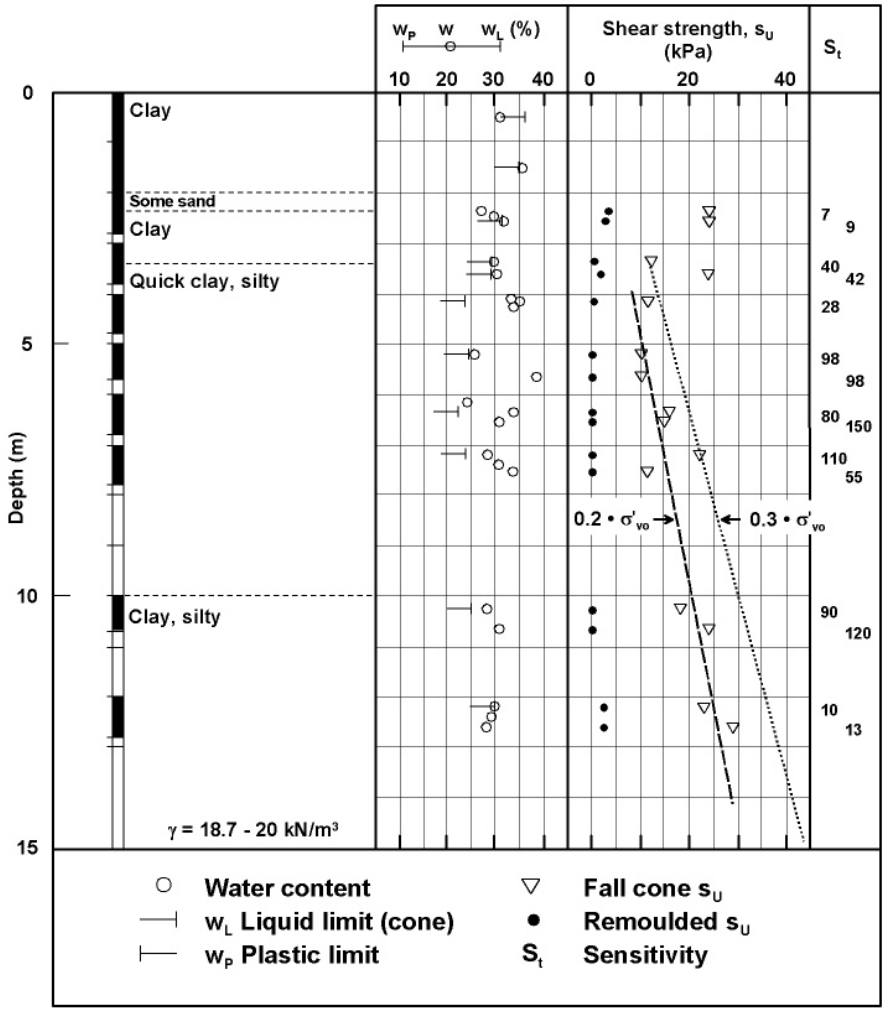
New Railway Track Nykirke, Norway



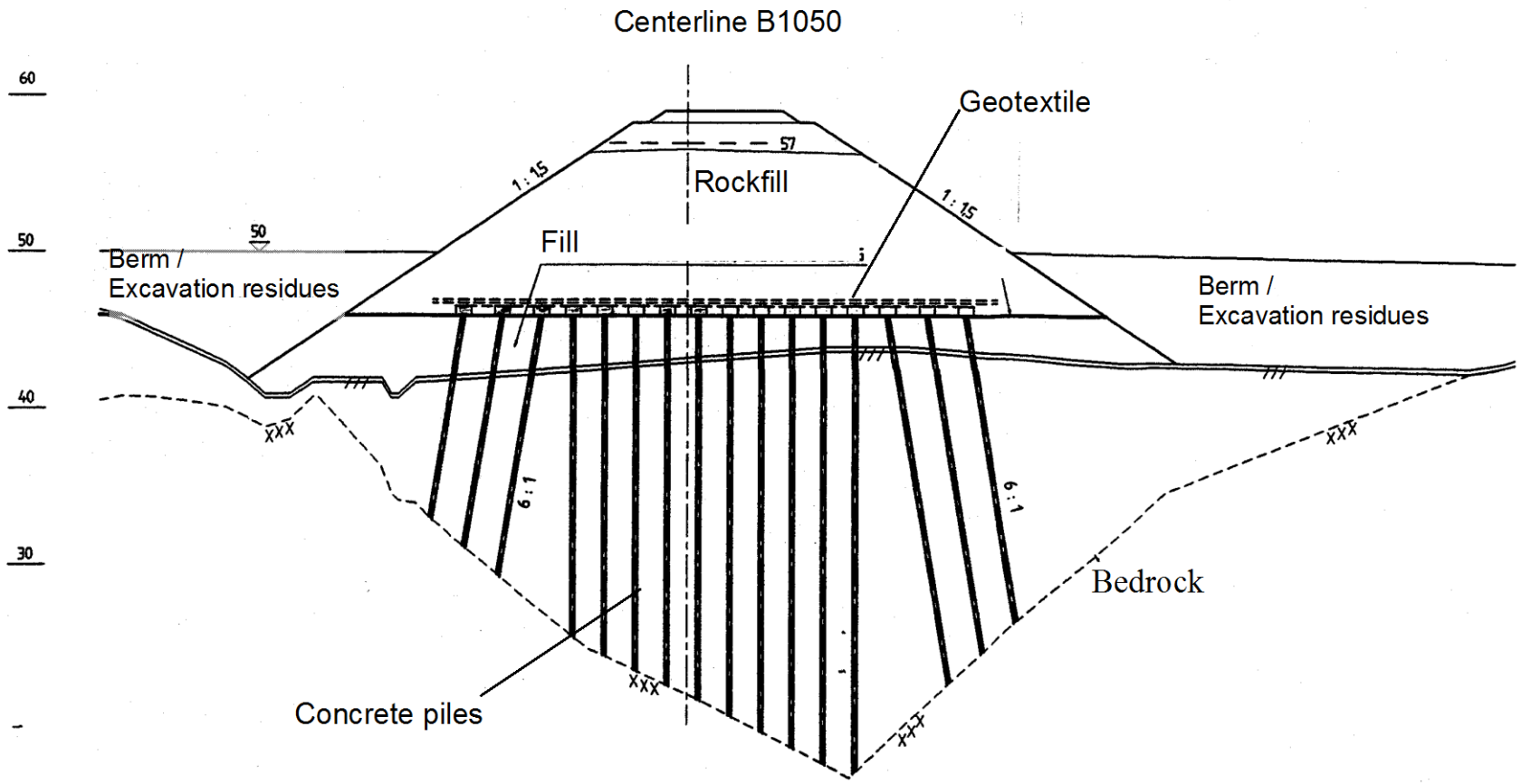
Nykirke Railway Track
New double track route



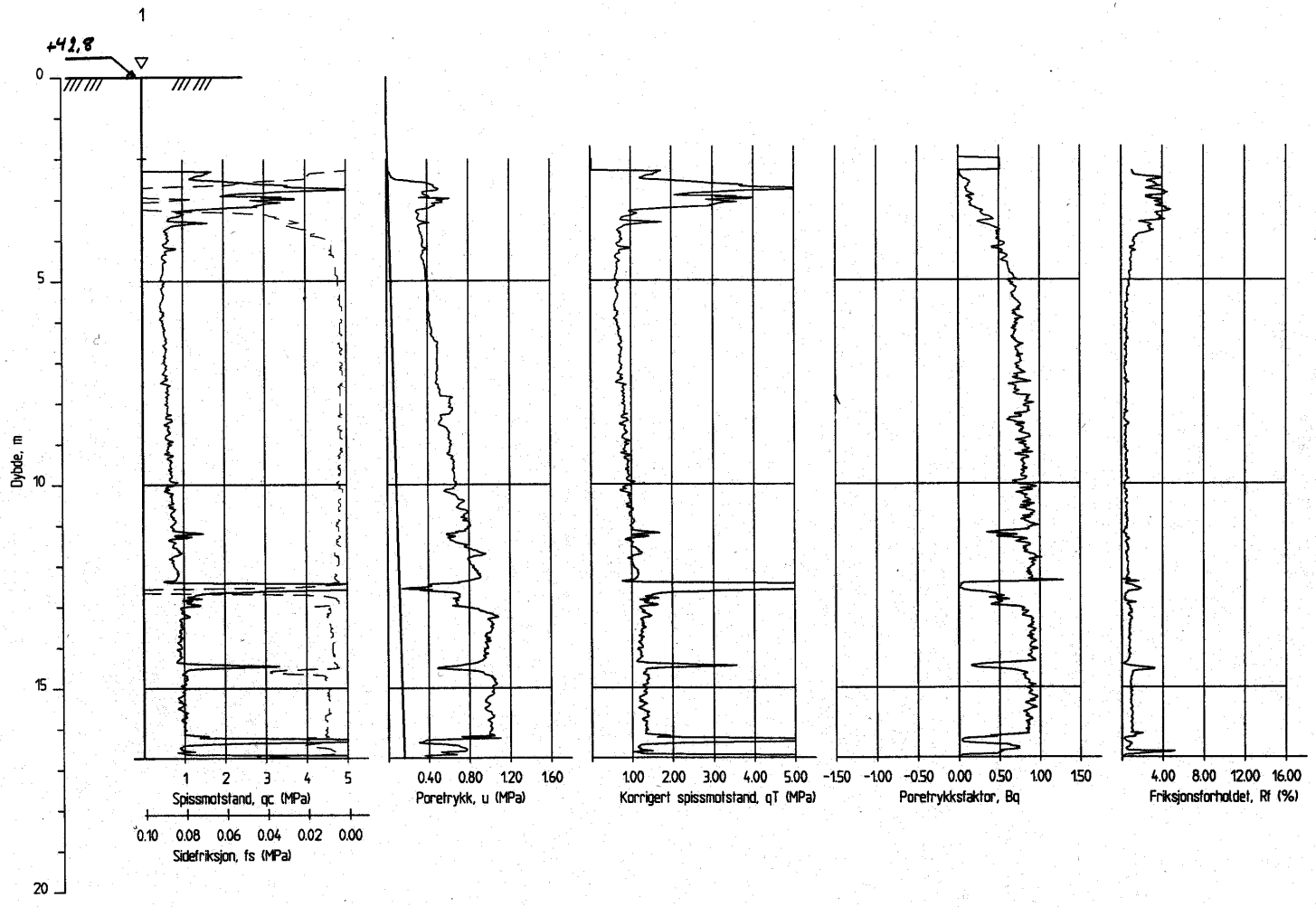
Results of standard soil boring with 54 mm composite piston sample



Nykirke Railway Track
Solution proposed in tender documents



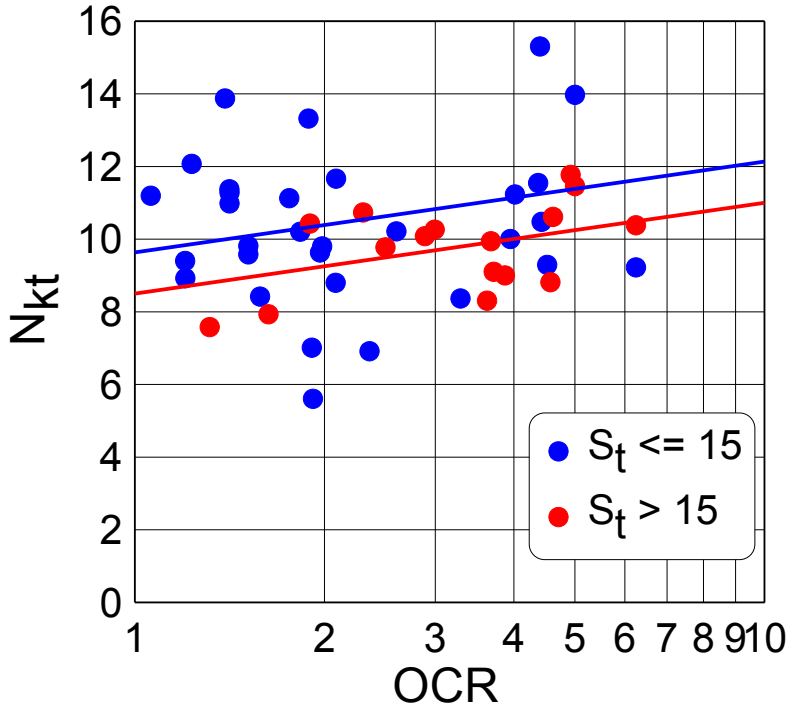
Results of CPTU; Nykirke Railway Track

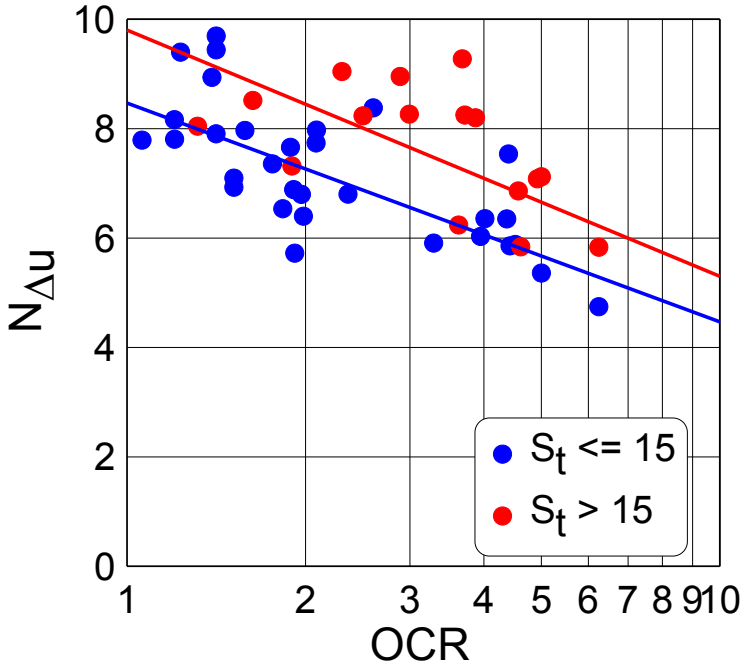


Cone factors from Norwegian and UK soft clay test bed sites

$$N_{kt} = (q_t - \sigma_{vo})/s_{uCAUC}$$

Undrained shear strength from CAUC triaxial tests on Sherbrooke block samples





$$N_{\Delta u} = (u_2 - u_o)/s_{uCAUc}$$

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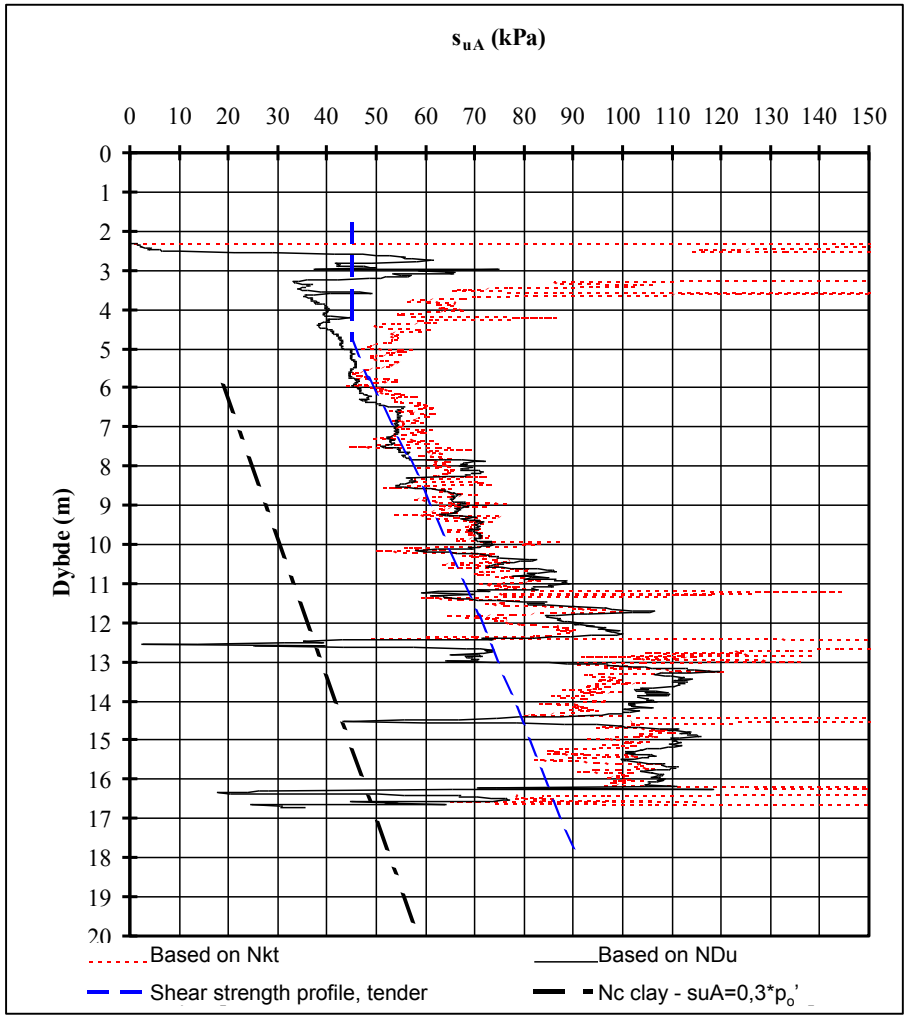
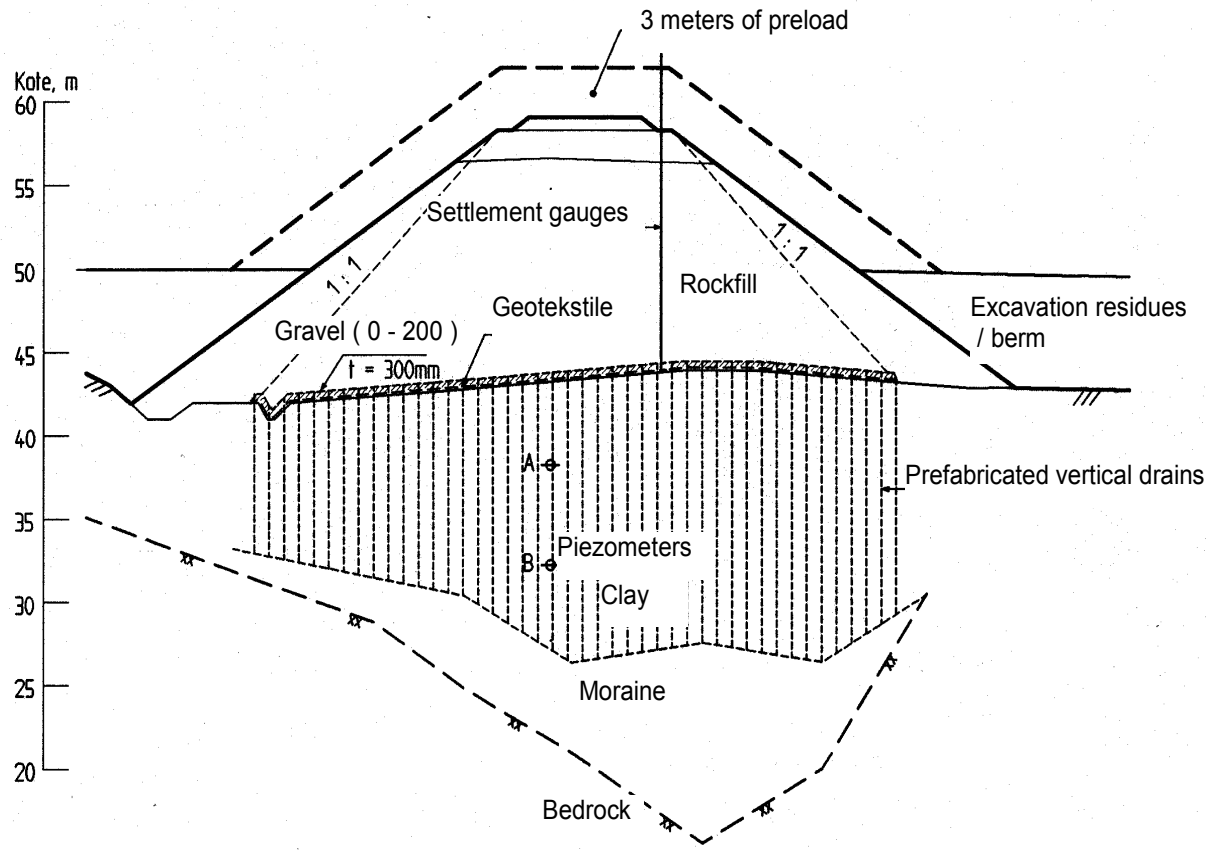
Undrained shear strength profile (s_{uA}), Nykirke Railway Track



Nykirke Railway Track, chosen solution



Sherbrooke block sampler

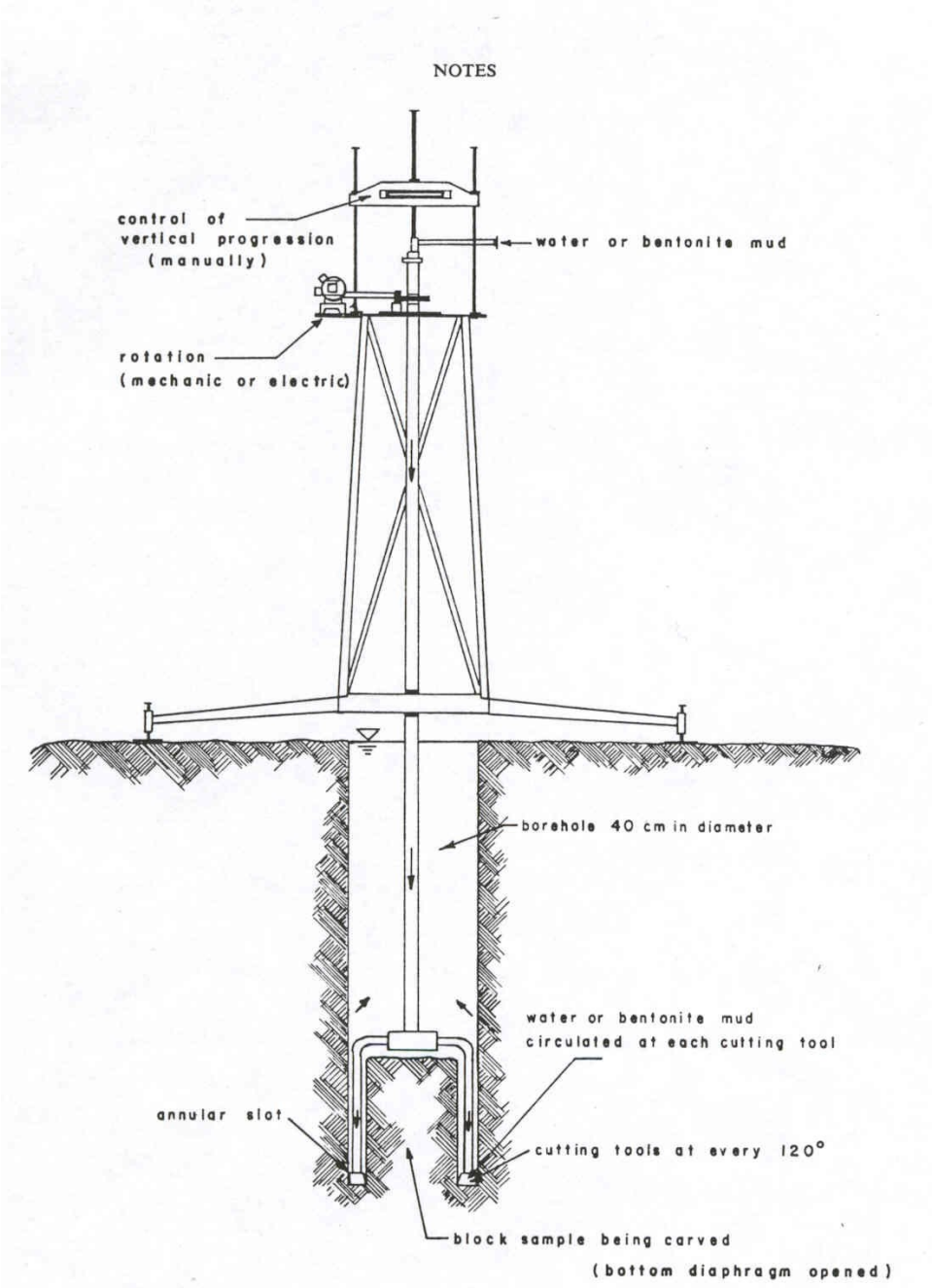


FIG. 6. Schematic view of a block sample being carved.

Lefebvre and Poulin, 1979

4.2a The drill rig used to operate the block sampler

4.2b Close up view of Sherbrooke block sampler

Block sampling with Sherbrooke sampler

NGI

Sampler is lowered into borehole

Sample as recovered

Spoil is gently removed by hand

Block sampling with Sherbrooke sampler

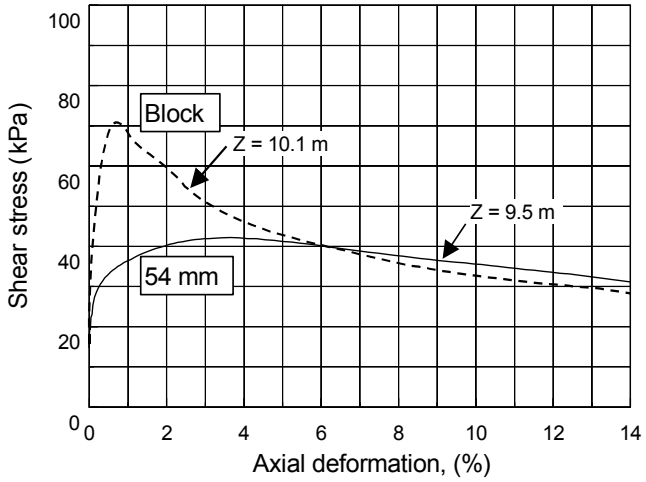
Block sampling with Sherbrooke sampler

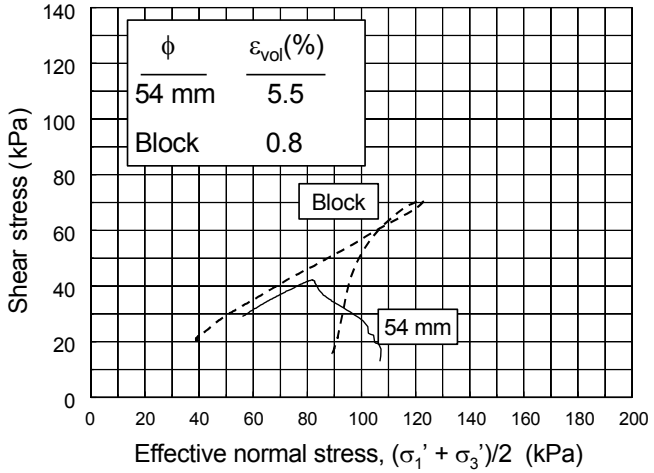
Complete sample prior to protection

sample initially protected by cling film, tin foil and tape, finally being waxed

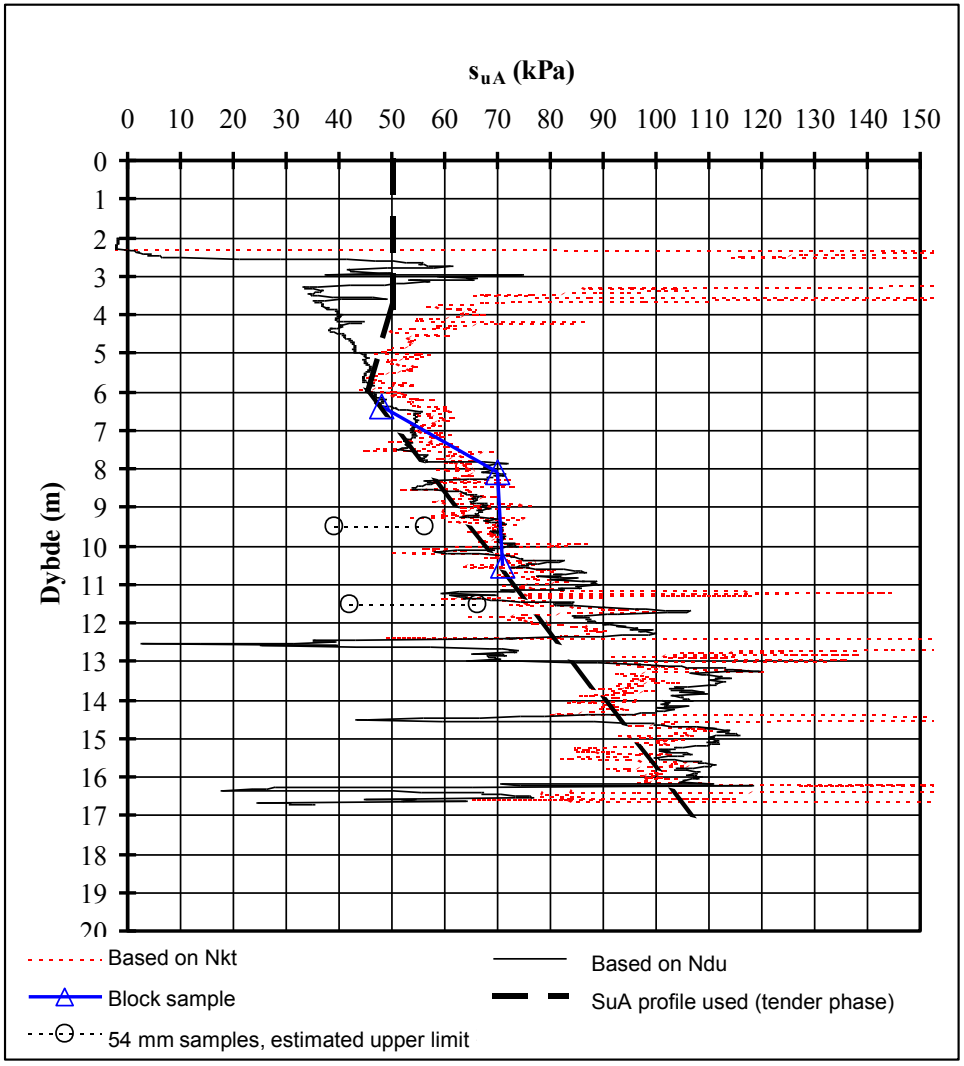
Sample ready for transportation

Results of CAUC tests on block and 54 mm piston samples; Nykirke Railway Track





Nykirke Railway Track



Case history Nykirke railway track

Upgraded shear strength profile resulted in possible change in technical solution

From stability viewpoint not neccessary with piles to rock

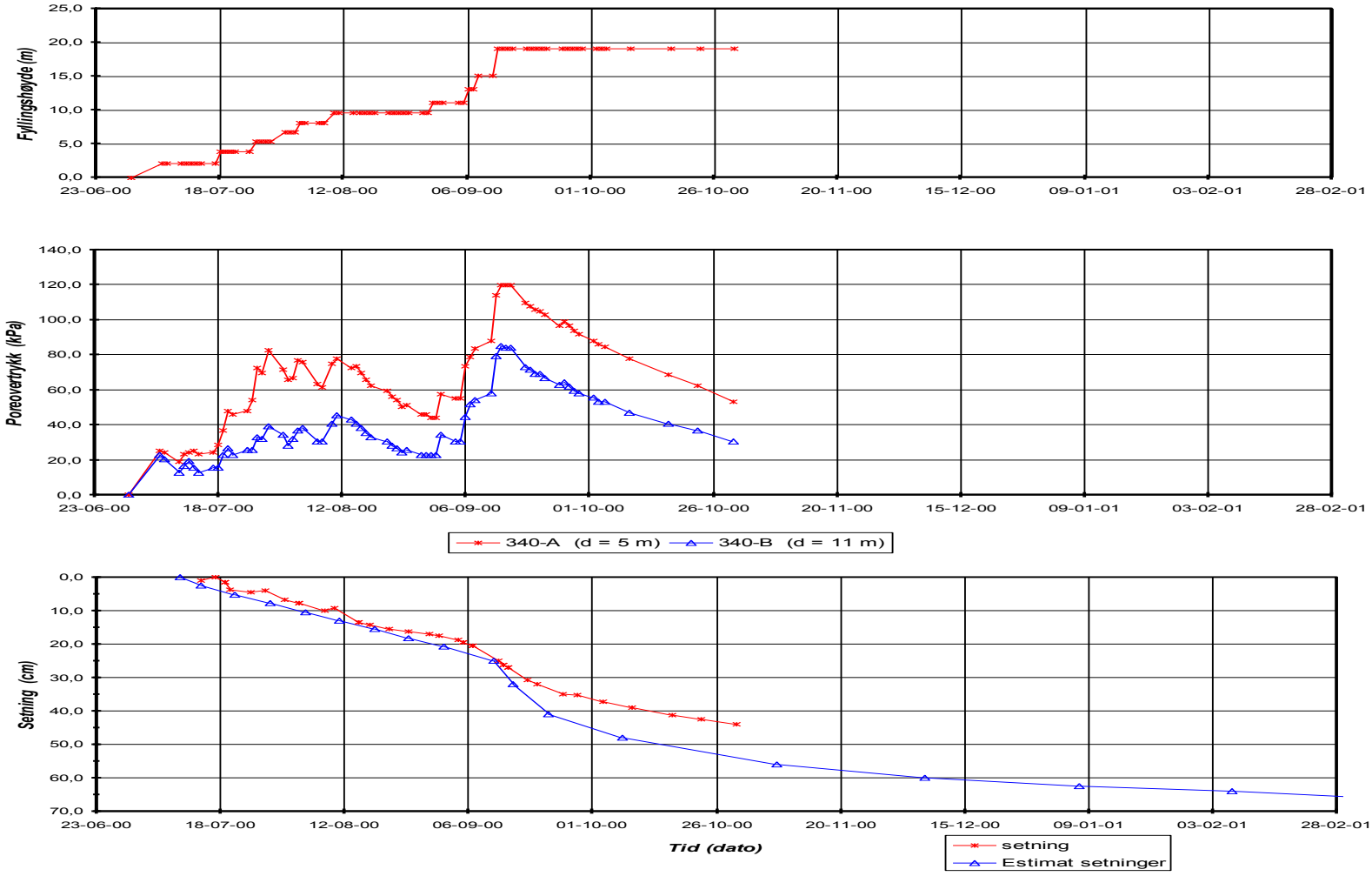
- Settlements could be taken care of by vertical drainage combined with preloading
- Total cost savings of about USD 1.2 mill or 25 % of total contract cost

Nykirke Railway Track
Placement of prefabricated vertical drain

Nykirke Railway Track
Placement of geotextile and 0.3 m gravel

Nykirke Railway Track
Placement of preload rock fill

Nykirke Railway Track
Measured pore pressures and settlement



Cone factors from Norwegian and UK soft clay test bed sites

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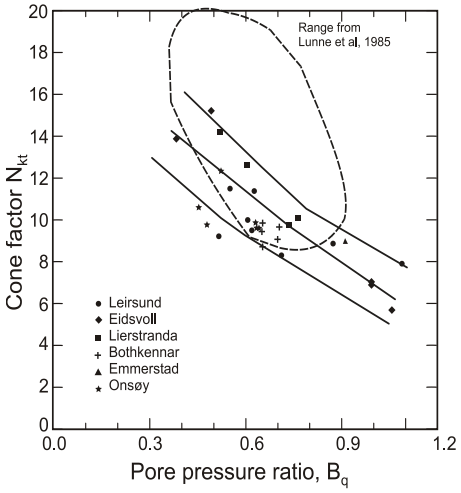
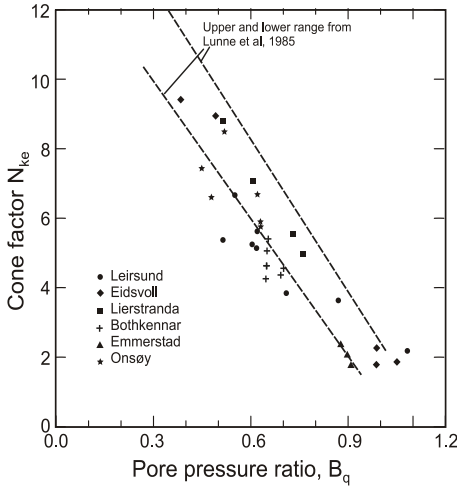
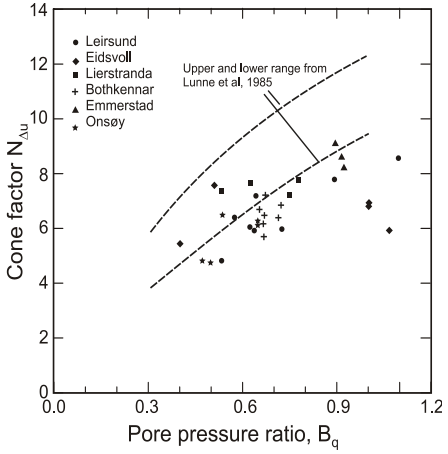




$$N_{ke} = (q_t - u_2)/s_{uCAUC}$$



$$N_{\Delta u} = (u_2 - u_o)/s_{uCAUc}$$

Undrained shear strength from CAUC triaxial tests on Sherbrooke block samples

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