Test site – Kärra

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Aim & purpose

- The aim of the project has been to find a suitable test site that can be used for a long period of time >40 years
  - Building a test bank
  - A soil profile that has clay with a thickness >30m has been the goal
  - Strengthen the empiric database and create a new one for deeper layers

- Start characterising the soil properties
  - Initial field and laboratory tests (ongoing project today)
  - Initial analysis in FE

History of old embankments

- Lilla Mellösa and Skå-Edeby (just outside Stockholm)
  - Two test embankments was constructed to find a suitable site for the new airport Arlanda
  - 1945 Lilla Mellösa test site was constructed
  - 1957 Skå-Edeby test site was constructed
  - Soil profile about 10-15 m of soft clay
  - Enormous amount data that has been gathered from these site to create empiric correlations for this type of soil

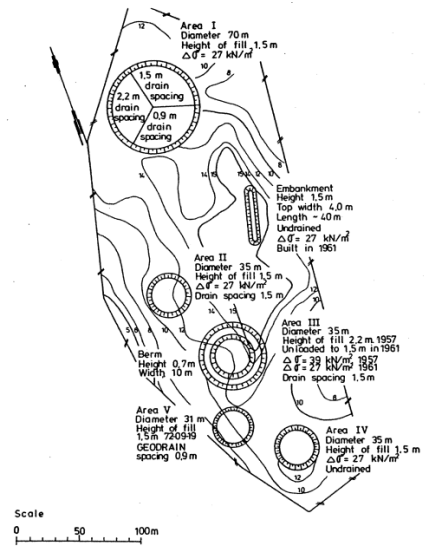


Fig. 13. **Karta över provfältet i Skå-Edeby med de olika provfyllningarna och nivåkurvor som anger djupet till fast botten. (Efter Terrafigo 1976).**

Från SGI Rapport 70

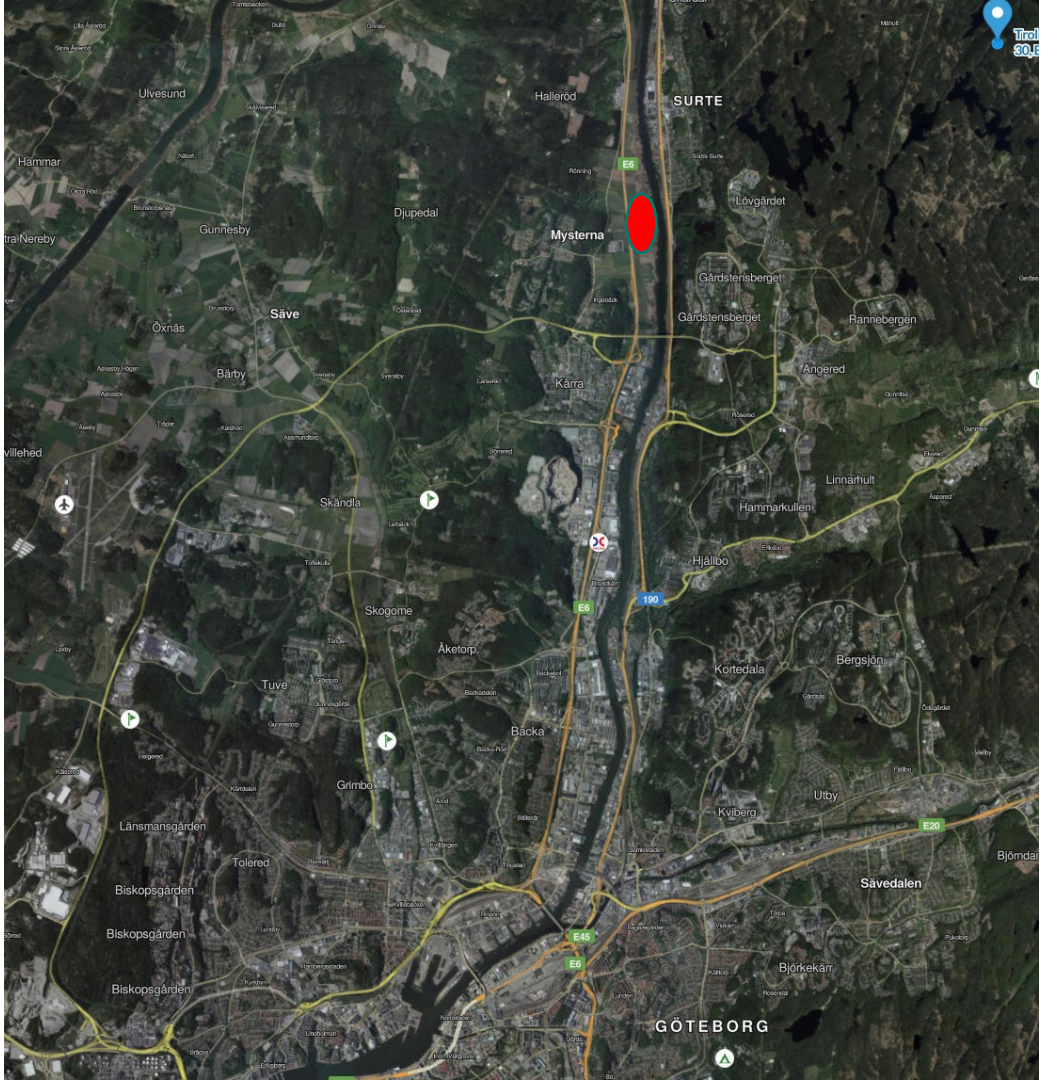
Limitations of “old” embankments

- Load from test fill IV
  - Exceeding the preconsolidation pressure for the entire profile
  - Cant study how it will behave for smaller stress increases not passing preconsolidation pressure
    - This is normally what we have in real life senarios
    - Very little, or none, information on this behaviour from field trials i.e. test embankments over long period of time (>20 yrs)
- Almost all Swedish empiric correlations that is used today is based in data for the top 15 m of soft soils

New test site Kärra

Location

- North of Gothenburg (about 1,5 km north of Angeredsbron)
- Ca 29 000 kvm



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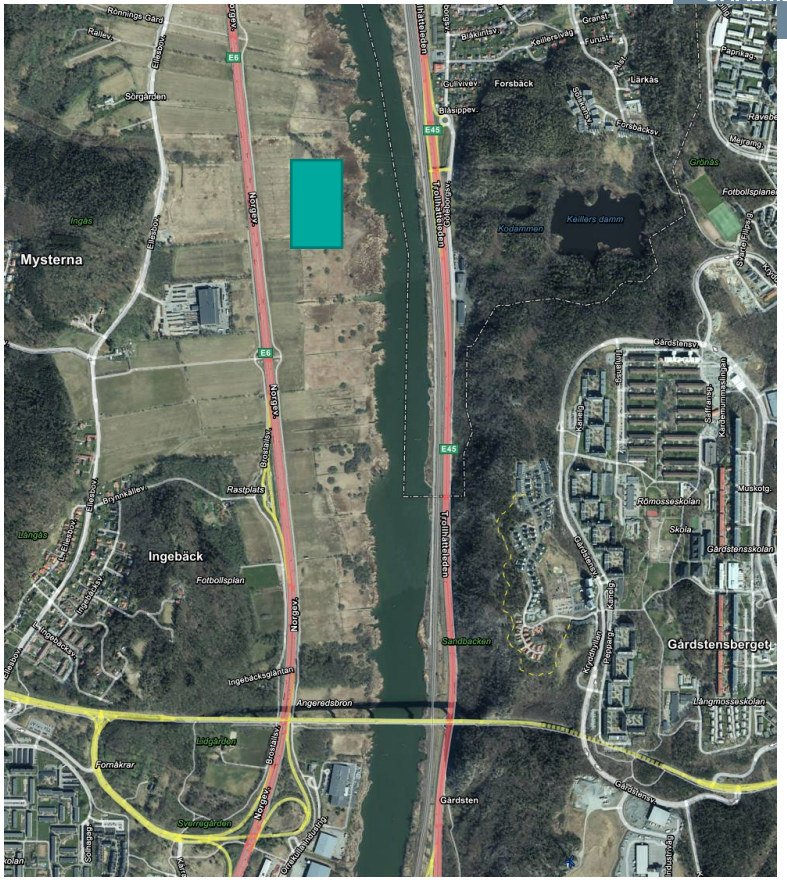
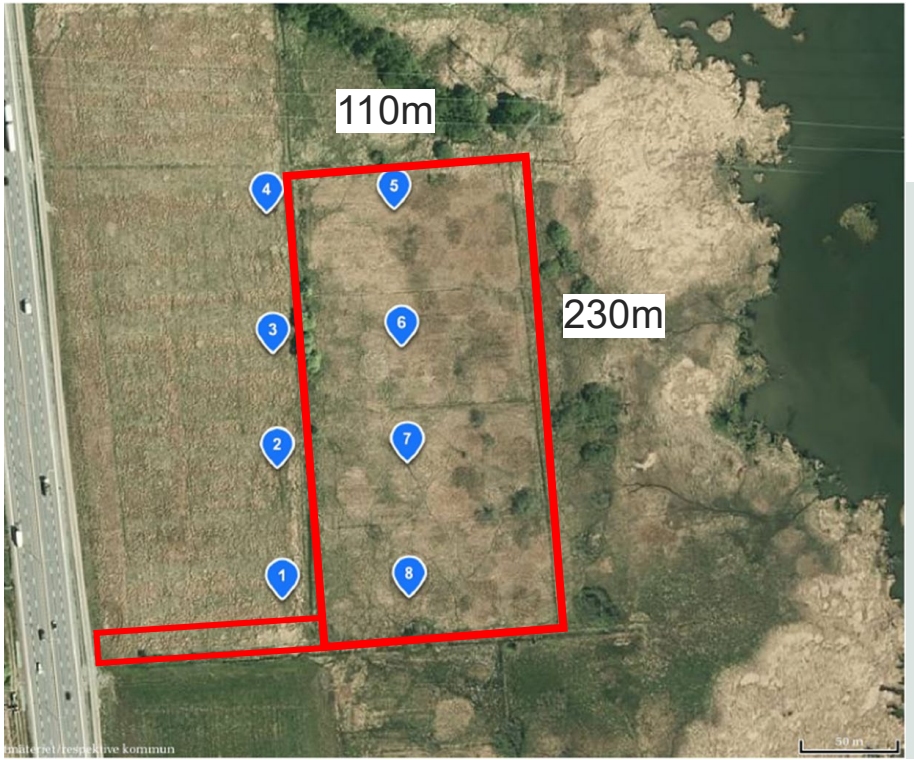
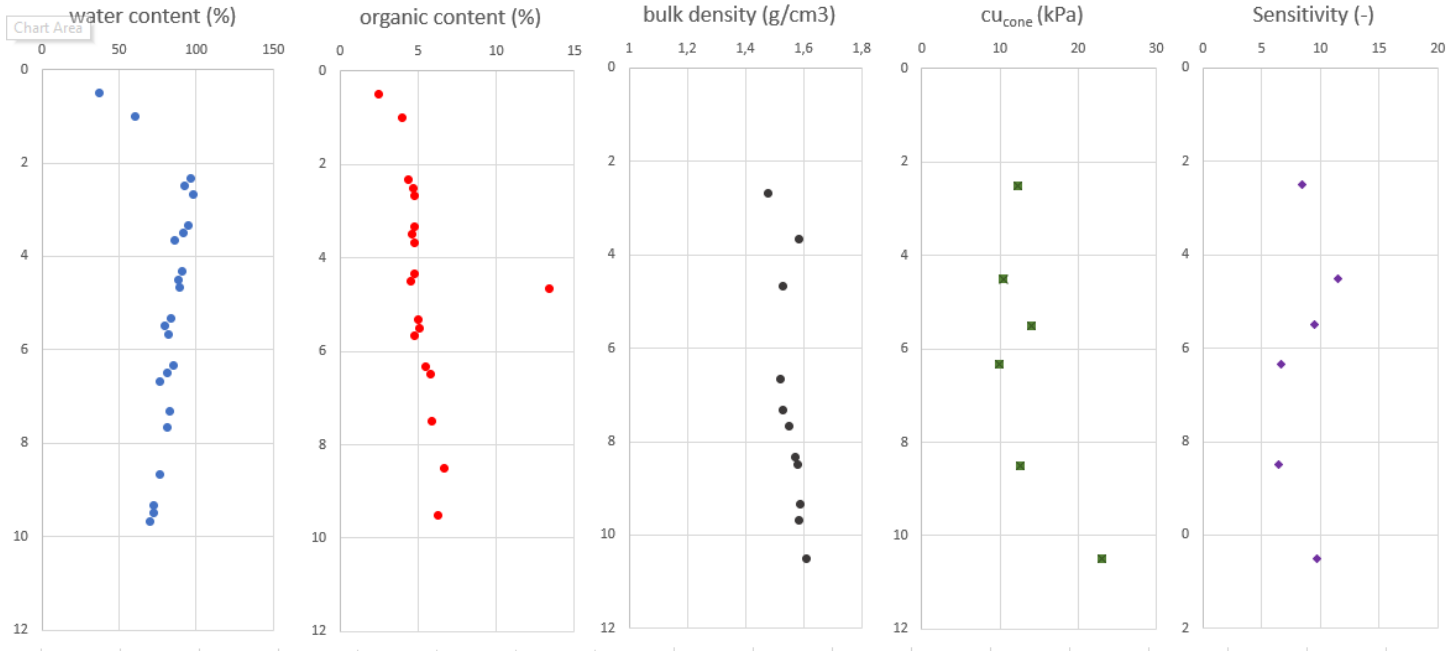


Soil testing

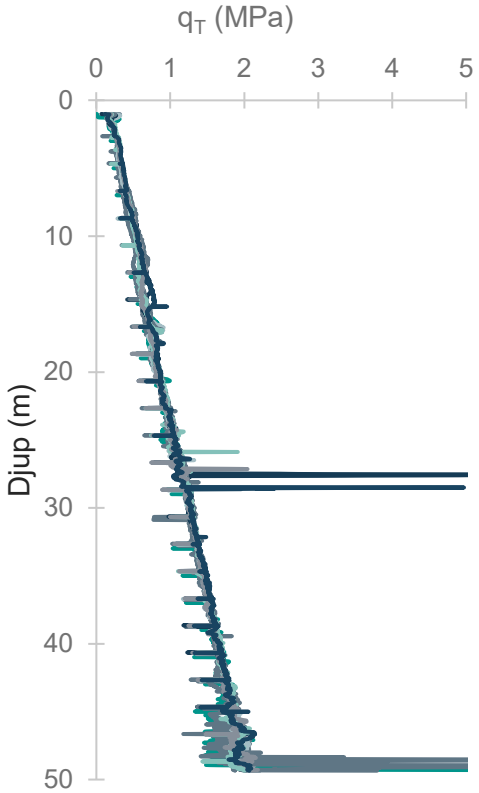
- 8 CPT soundings to verify the depth and soil profile
- In borehole 8 undisturbed testing as started
  - Determine index properties, strength, stiffness etc
- Other testing

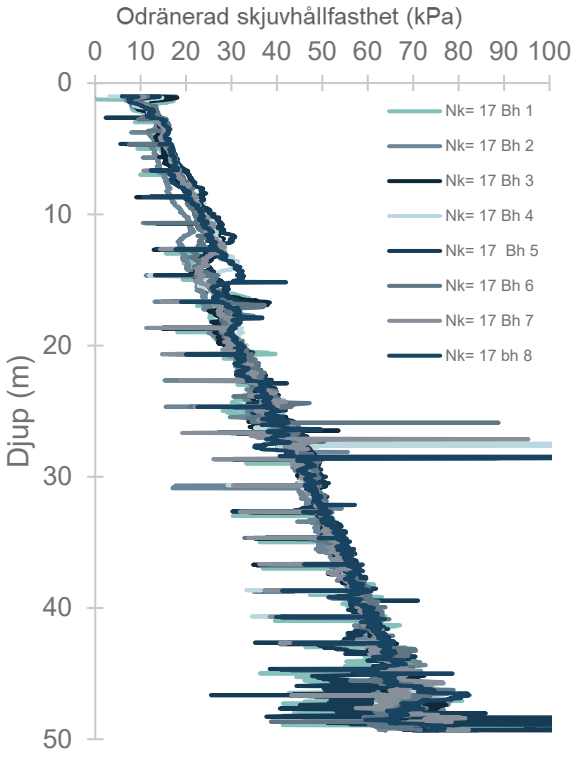


Index testing

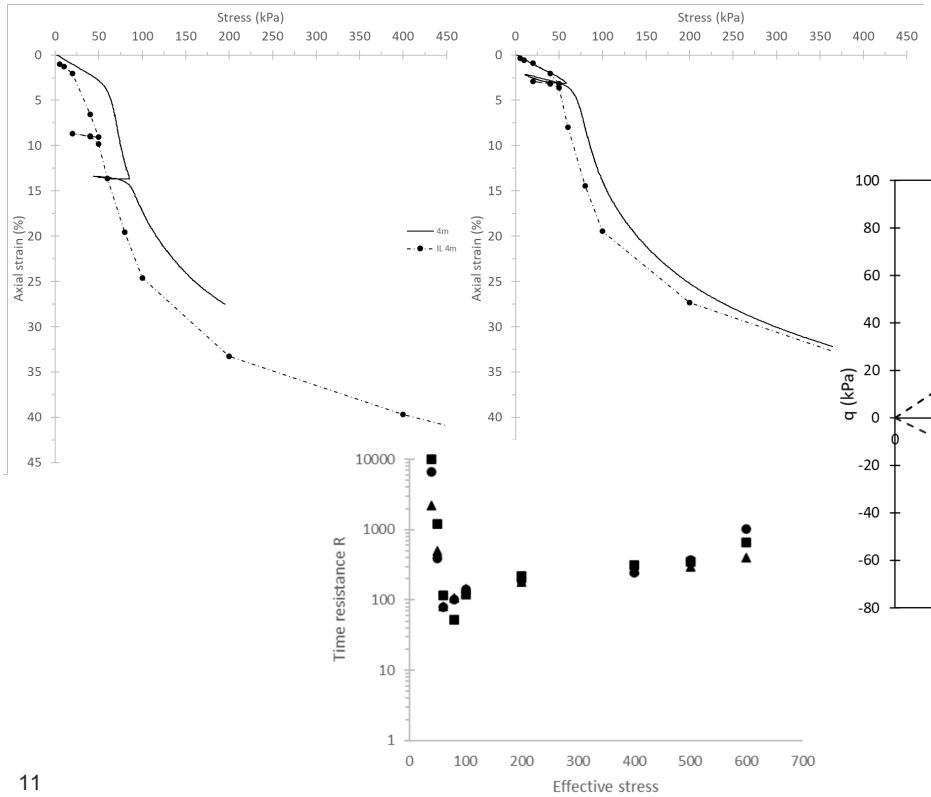


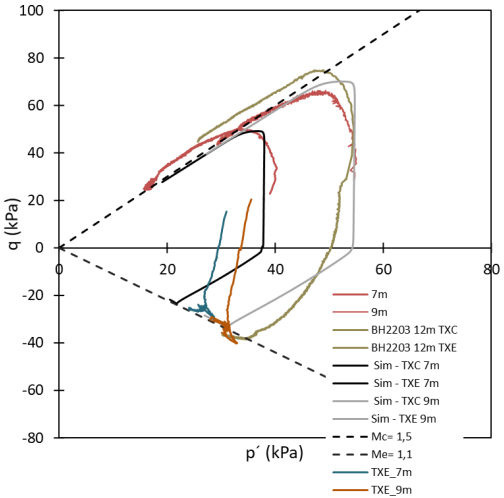
CPT soundings

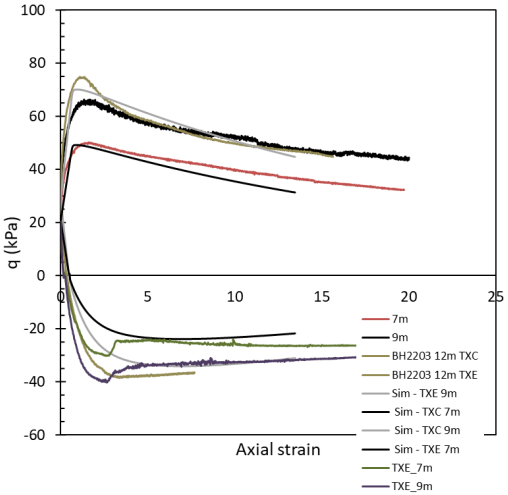




Laboratory testing

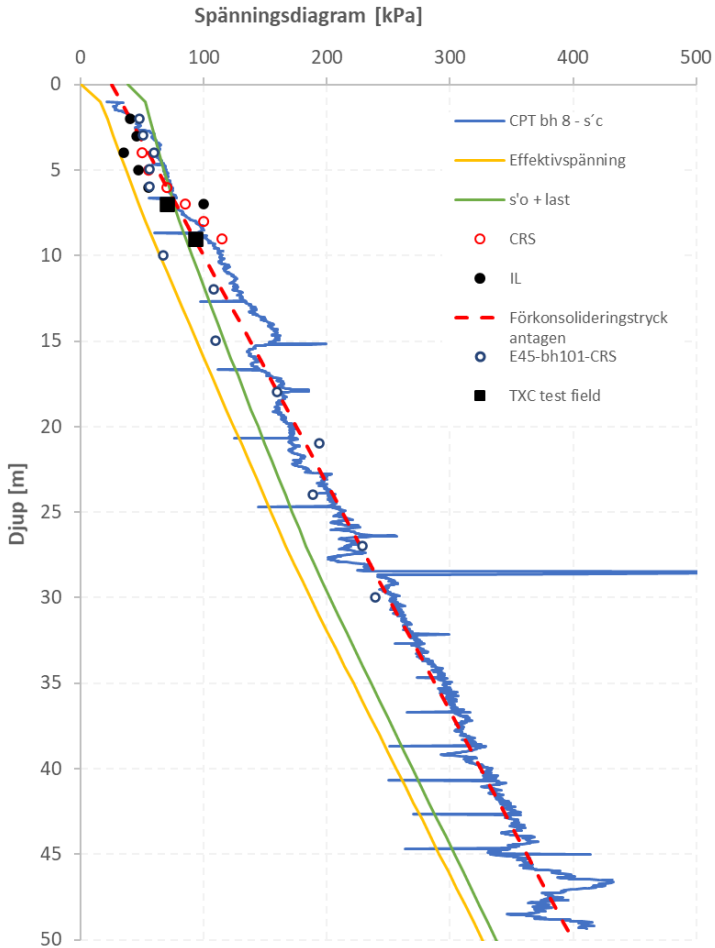






Stress profile

- Top 10 m tested in lab
- Incl. old CRS tests from E45 (other side of Göta Älv)

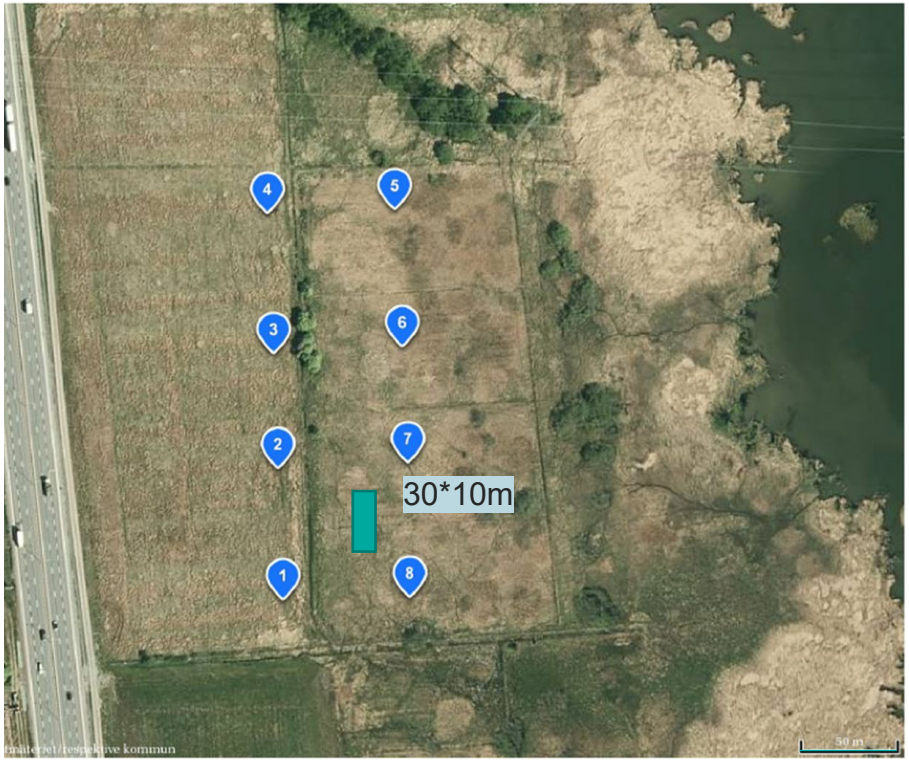


Test embankment

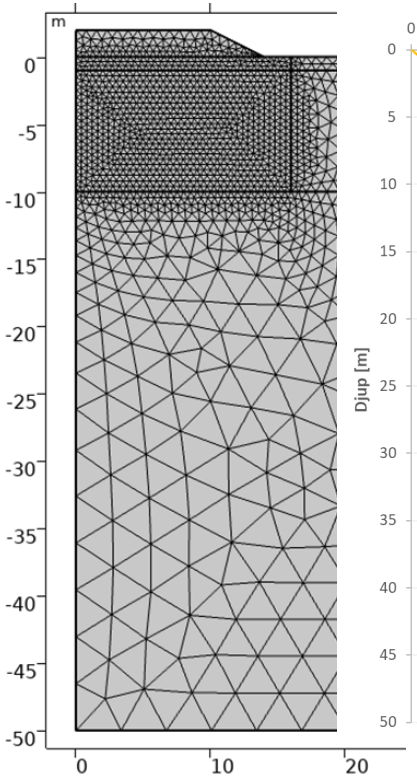
Test embankment design

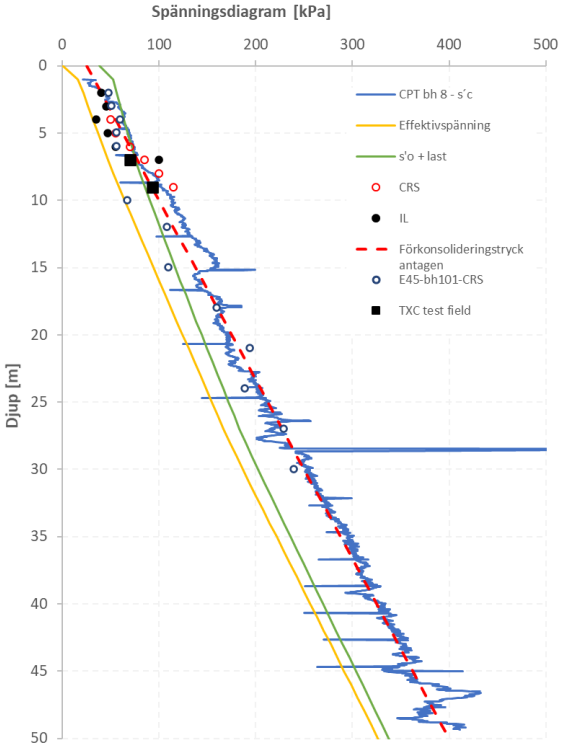
- width about 7-10 m slope crest
- Length min 30 m
- Minimize 3D effects

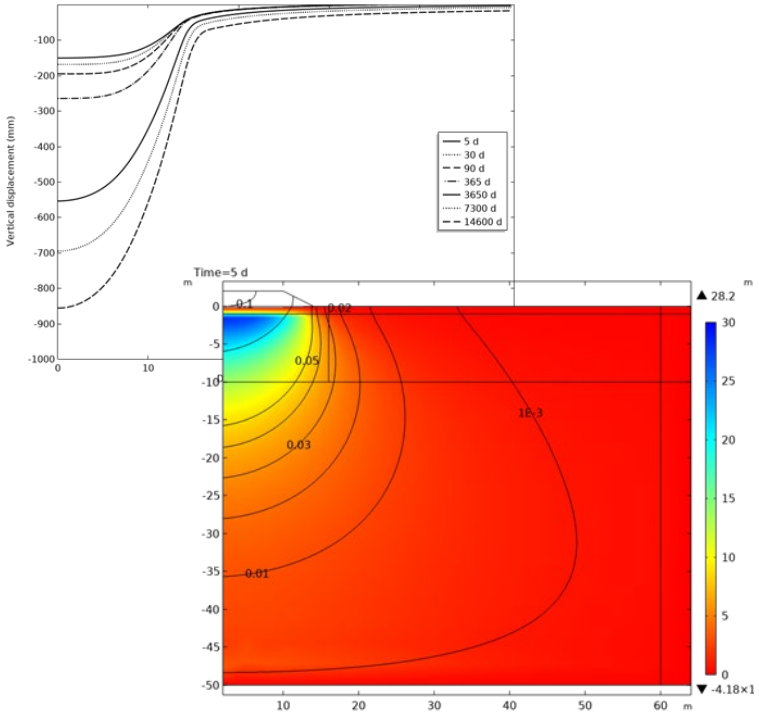
- alternatives
  - 2 different heights (1 m resp. 2 m)
  - Effect of 3D?



Modelling of test embankment (width=20m)
Comsol Myltiphysics is used with Creep-SCLAY1S

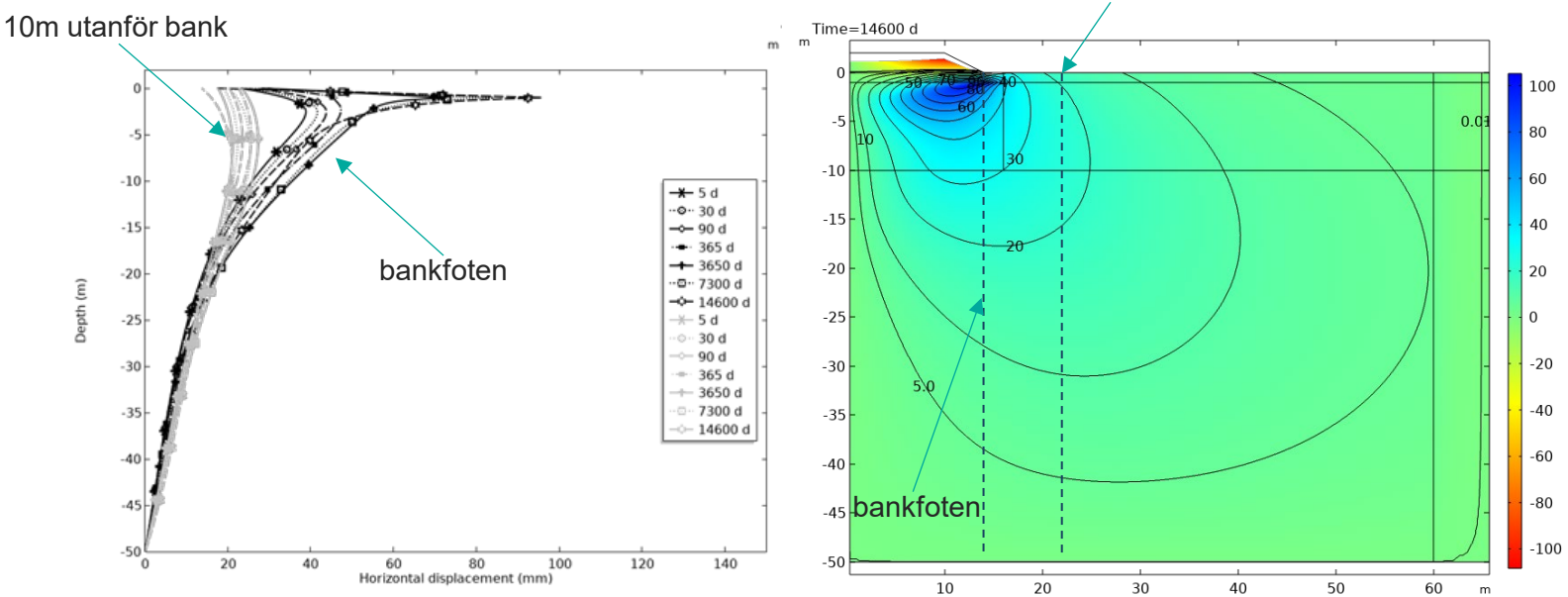






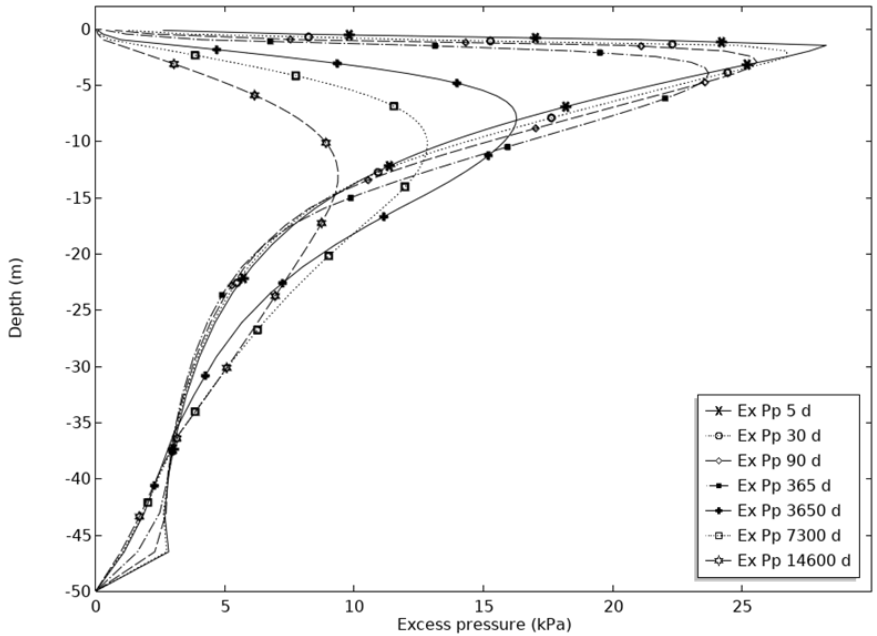
Modellering av Provbank - Resultat

Horisontalrörelse mot djup för olika tider



Modellering av Provbank - Resultat

Porövertryck för flera tider mitt under banken



Placering av mätutrustning - vision

Minst 3 sektioner med 5 ”mätpunkter” per sektion

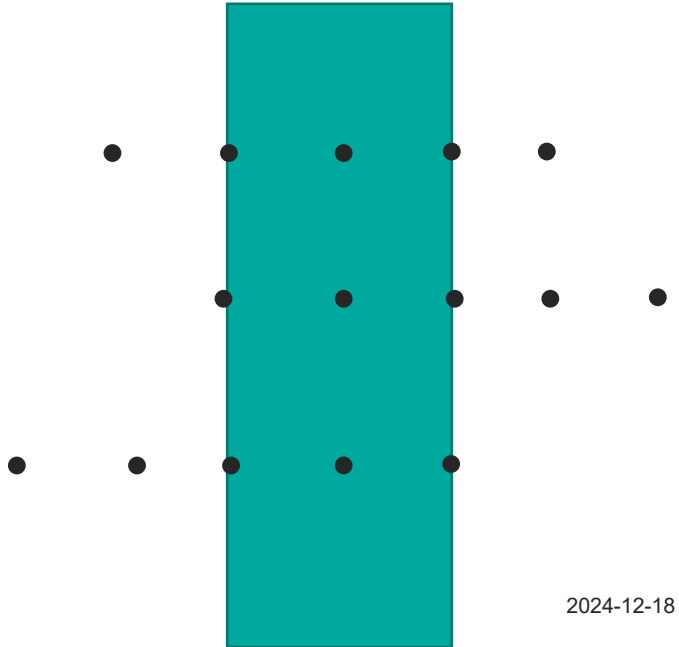
”Klassiska” mätmetoder

- 4 st inklinometrar ca 20–30 m djup
- 5 st bälgslangar till ca 45 m djup
- 2-4 st slangsättningsmätare
- 20 st portryckmätare (3-6 per mätpunkt)
- 8 st jordtrycksdoser
- 5st markpeglar

”Nya” mätmetoder

- Fiber mfl
- Ny utvecklade eller modifierade

Alt. placering av mätpunkter



Conclusions

- Area is suitable for building a test embankment
- Test site could give invaluable data for especially deeper soil behaviour
- Could be used for a long time
- No disturbance from other activities
- Could also work as a test site for e.g.,
  - Long term testing of Lime/cement columns (LCC) or other binders
  - Testing and development of in-situ equipment
  - Sampler development
  - other
- Could improve/optimaize how we estimate the settlement for deep foundations (floating piles, LCC other)
- Easy access to area due to existing side road (gravel)
- No plans for any constructions in the nearest 50 yr at this area.

CHALMERS