

VT8

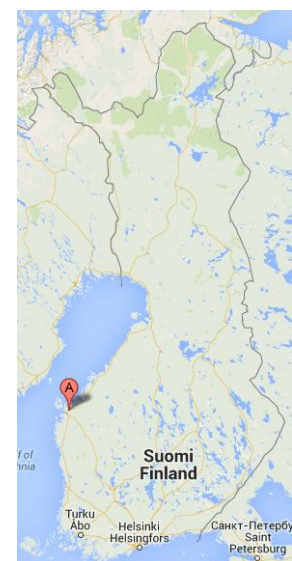
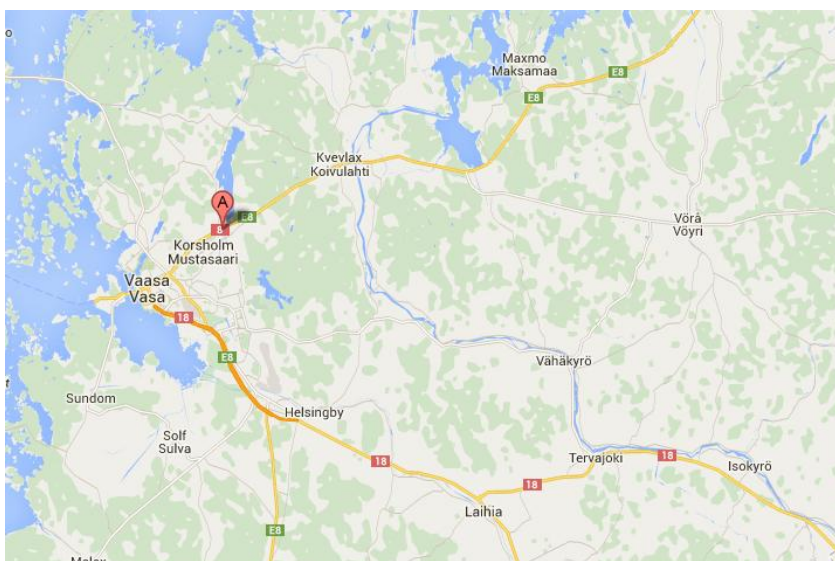
Vaasa, Finland

Mass stabilization as a solution to the problem of sulphide clays.

Key words:

sulphide clays, environmental problems, column- and mass stabilization

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|--------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| General information                        | During the improvement works on the Highway No. 8 between Kotiranta-Stormossen in Vaasa, a large area of soft sulphide clays was discovered. In the case of mass exchange, excavation of sulphide clays away from the anaerobic environment under the ground water and moving them to the aerobic conditions would result in considerable environmental problems. According to the requirement of the environmental authorities, sulphide clays from the road section were to be treated with i.e. lime. However, during the progress of the project it was decided that the sulphide clay masses would remain in its location and the final structure consisted of column stabilization combined with mass stabilization. |
| Advantages of stabilization                | Deep stabilization gave the opportunity to avoid a large-scale mass exchange operation with associated environmental nuisance and environmental problems due to release of sulphuric acid from the silt and clay masses.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| Project timetable                          | 9.2011 – 11.2014, stabilization works were carried out in 2012.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| Volumes and dimensions                     | Column stabilization 246 000 lm (linear meter), mass stabilization 115 000 m <sup>3</sup> .                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| Geology and stabilized material            | Challenging ground conditions (muddy clay and silt containing sulphur compounds)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| Target strength of the stabilized material | Target 180 days shear strength for stabilized soil was 100-150 kPa.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| Binder(s)                                  | Mass stabilisation PlusSe 100-150 kg/m <sup>3</sup><br>Column stabilisation Nordkalk GTC 120-160 kg/m <sup>3</sup> (gypsum-lime-cement)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| Laboratory and field tests                 | Technical and environmental (e.g. pH monitoring of stabilized acid sulphate soil samples) laboratory test were done to determine correct amount of binders. Tested binder amounts were also verified in small scale pilot stabilization before actual stabilization.                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| Other                                      | The deep stabilization reduced the needed mass exchange volume from 400 000 m <sup>3</sup> to 10 000 m <sup>3</sup> and the transport need for soil reduced altogether 200 000 km.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| Long-term follow-up and lessons learned    | The main environmental targets in the construction site were efficient utilization of available materials. Long term follow-up measures was not designed in the project.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| Sources                                    | Autiola, M. et. al. (2013) <i>Achieving the "unrealistic" target by innovations based on environmental requirements</i> . The XXVIII International Baltic Road Conference.<br>Pasanen, K. (2014) <i>Sulfidimaiden käsittely tierakentamisessa -case Vt8 Sepänkylän ohikulku</i> , Thesis (in Finnish).                                                                                                                                                                                                                                                                                                                                                                                                                     |
| Stabilization contractor                   | Skanska Oy                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |



Lighter top layer is oxidised sulphate soil, darker soil below is unoxidised sulphide clay.



Mass stabilization under process.



Sectional drawing of soil base.

