

A geophysical investigation of the landfill Albäck, Trelleborg, South Sweden with the use of GEM2 (stångslingram)

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Solid waste leachate is generally associated with high ion concentrations and low resistivities. Hence, geophysical methods are of significant interest for mapping leachate migration inside, and around, landfills. Geophysical investigations can be used for monitoring of spatial leachate distribution, mapping of contaminants and quality control of soil stabilisation/contaminant immobilisation and long term monitoring. At last SARDINIA conference, a large number of pilot and full-scale applications were presented (see for instance Rosquist et al, 2007; van Praagh et al, 2007; Bouye et al, 2007; Wagner et al, 2007; Jolly et al, 2007; Moreau et al, 2007; Kamura et al, 2007).

In southern Sweden, the solid waste company SYSAV operates four landfills. Sysav, South Scania Waste Company, is a municipality owned Waste Corporation, operating in 14 municipalities in Southern Scania, Sweden. On two of the plants, the landfills will be closed by the end of 2008, due to the new requirements on landfill construction.

One of the, the Albäck landfill in Trelleborg, has been in operation since 1974. Leachate that is collected from the landfill is drained in two separated drainage systems. The older part, part 1, was equipped with drainage pipes, leachate wells and pumps when it was taken into operation in the middle of 1970ies. The younger part has a drainage system from 1985. Between the two areas, a cut-off ditch filled with macadam is laid. It separates the leachate systems from each other. Along the northern border of the landfill, another drainage pipe system is laid out in order to avoid groundwater from entering the leachate system. The groundwater is led to the municipal stormwater networks.

All leachate collected in the landfill is finally discharged to the municipal wastewater treatment plant for final post-treatment. On the Albäck landfill, approximately 80 000 m³/y of leachate is produced. The younger part (part 2) produces approximately 60 000 m³/y, while the older part (part 1) contributes with 20 000 m³/y. In table 1, the typical composition of the leachates from the Albäck landfill is presented.

Table 1. Typical composition of leachate from the Albäck landfill

Parameter	Concentration (mg/L)
Al	0.03
Ca	250
Fe	0.8
K	65
Mg	50
Mn	0.1

Na	160
S	65
Cl	175
PO4-P	0.04
SO4-S	40
NH4-N	15
NO3-N	8
TOC	12
pH (no unit)	7.5
Conductivity (mS/cm)	1.7

During the summer 2008, the landfill Albäck has been investigated with the use of GEM2 (Geophex, NC, 2008). GEM2, geophysical electromagnetic method mark 2, has the capacity to produce large amounts of geophysical data at modest field-work efforts. It is operated by a hand-held sensor, which operates in a frequency band between 90 Hz to about 24 kHz. Due to the fast operating software, a surveyor can cover approximately four hectares per working-day with a line spacing of two meters. The equipment can be used for collecting data-points of roughly one point per decimetre (resulting in 100,000 data points per working-day). The sensor normally operates in a frequency-domain mode and the collected data can be used to image a 3-D distribution of subsurface objects.

At least 400 geophysical measurements have been made at site during two intensive weeks at Albäck. The method seemed to be very promising for the landfill Albäck and a conceptual model of landfill shape and low-resistivity areas in and in the vicinity of the landfill could be identified as well as high-resistivity areas in the landfill. The applicability of the method and its limitations will be discussed and a comparison with CVES-measurements of the same area presented.

http://www.geophex.com/Product_page/GEM2/gem2mainpage.htm (2008-09-05)

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