

Clastic lake fills

in the Rhine-Meuse delta

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Introduction and study area

Lakes occur in distal zones of deltaic plains. They form in peat areas where fluvial activity is absent. These lakes may fill in with organics or with clastic deposits when a river occupies the area. In the Rhine-Meuse delta so-called clastic lake fills have been reported but never described in detail. This hampers e.g. the assessment of hydrological and geomechanical properties of the deposits. The aim of this study is to identify the architecture and facies distribution of clastic lake fills in the Rhine-Meuse delta. Two study areas were selected: 1) the central delta where clastic lake fills are present at the base of the Holocene succession and 2) the Angstel-Vecht area (Fig.1). The results of the Angstel-Vecht area are presented here.

Methods

In the Angstel-Vecht area clastic lake fills are present near the surface. This enabled detailed analyses of the facies distribution of the clastic lake fills. Based on a high resolution DEM and corings a geomorphogenetic map and cross sections were constructed. From these the architecture and facies distribution were determined. Facies interpretations were based on sedimentary, pollen and diatom analyses. Diatom and pollen analyses were carried out on 44 samples distributed over two mechanical cores.

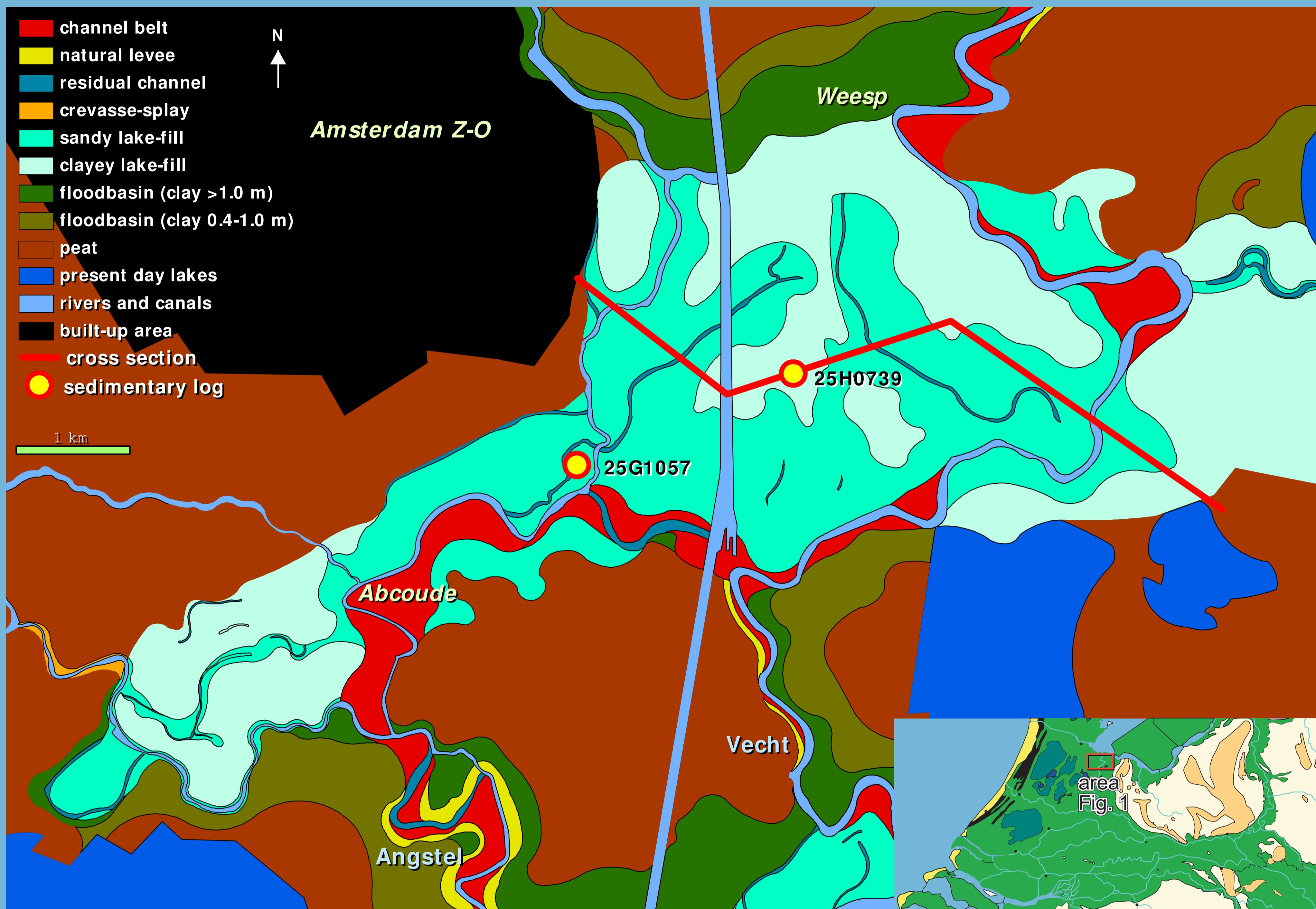
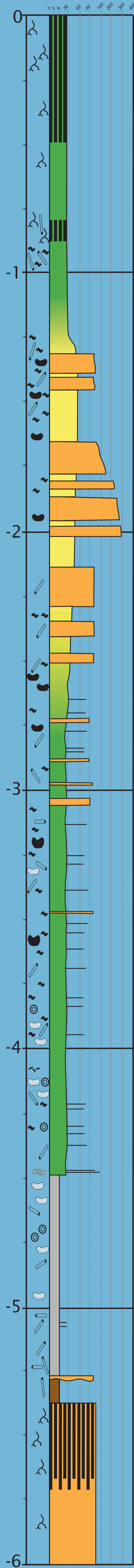


Figure 1. Fragment of the geomorphogenetic map of the Angstel-Vecht area showing the extent of the clastic lake fills between Abcoude and Weesp. The sand sheet is thick where the Angstel debouched in the lake and progressively becomes thinner towards the northeast. Indicated on the map is the location of the selected cross section (Fig. 2), and the sedimentary logs (Fig. 3 - 4).

Results

The area of the investigated clastic lake fills is up to 30 km², the thickness is 3 - 5 m (Fig. 1 - 2). The transitions to the surrounding peat are generally sharp and marked. The deposits consist of a clastic layer that includes a coarsening-upward sequence overlying organic lake sediments (gyttja). The sedimentary logs (Fig. 3 - 4) show the laminated character of the deposits, indicative for lacustrine deposition. The diatom and pollen analyses clearly indicate deposition in a standing fresh water body of which the depth decreases upward in the sequence. Comparable results are found in other investigated areas in the Rhine-Meuse delta.

Conclusions and further research

Lakes act as sediment traps. Therefore, the sediment characteristics of the fluvial system are reflected in the composition of clastic lake fills. Clastic lake fills can be recognized as separate architectural elements in distal zones of fluvio-deltaic successions because of distinct geometrical and facies properties. They are potential ground water and hydrocarbon reservoirs. Clastic lake fills are associated with peat areas and are prominent at the base of fluvial successions. They often include significant portions of sand, in the Angstel-Vecht area > 25 %. This greatly affects the hydrological and geomechanical properties which are important for reservoir characteristics.



Figure 3. Sedimentary log of a coring near Abcoude (the location is indicated in Fig. 1). Note the coarsening-upward succession in the clastic lake fill and the frequent occurrence of peat clasts.

Figure 2. Lithologic cross section through the clastic lake fills between Abcoude and Weesp. The clastic lake fill deposits are enclosed by the blue line. The location is shown in Fig. 1.

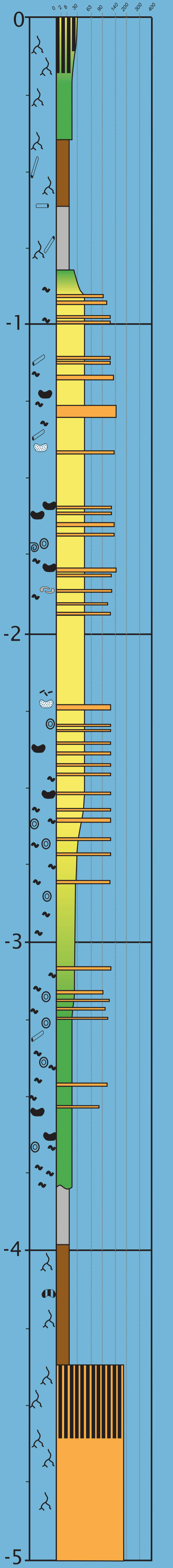


Figure 4. Sedimentary log of a coring near Weesp (location is indicated in Fig. 1 - 2). Note the continuous laminated character and the occurrence of vivianite indicating fresh water conditions.

