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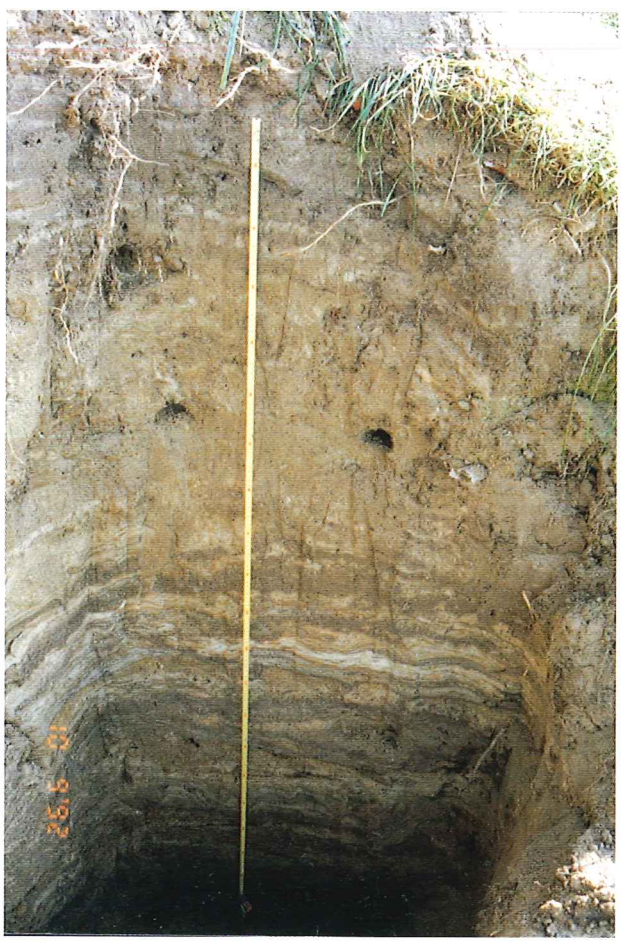
REGIONAL GEOCHEMICAL MAPPING OF OVERBANK AND STREAM SEDIMENTS IN BELGIUM AND LUXEMBOURG

VOLUME I
BASIC DATA ON THE SAMPLED OVERBANK PROFILES FROM BELGIUM AND LUXEMBOURG



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VOLUME I
BASIC DATA ON THE SAMPLED OVERBANK PROFILES FROM BELGIUM AND LUXEMBOURG

by

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2000

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1. INTRODUCTION

In four volumes, of which this one is the first, the results of the geochemical mapping project based on overbank and active stream sediments of Belgium and Luxembourg will be presented. This project was carried out as part of the WEGS project "Regional geochemical mapping of Western Europe towards the year 2000". The four volumes, issued under a common title "**Regional Geochemical Mapping of Overbank and Stream Sediments in Belgium and Luxembourg**" are:

Volume I - Basic data on the sampled overbank profiles from Belgium and Luxembourg
Swennen, R., Brusselmans, A., De Coene, E., De Vos, W., Van der Sluys, J. and Van Keer, I, 2000

In this volume, precise site locations, overbank profile descriptions and results of the chemical analysis are provided. Each site is located by means of a topographical map on a 1:25000 or 1:50000 scale. Drawings of the described overbank sediment profiles, on a scale 1:10, illustrate the detailed descriptions. The results of the chemical analysis of the upper and lower overbank sample (respectively U- and L-sample) and active stream sediment (S-sample) are presented in tables.

Volume II - Statistical treatment of the geochemical data of overbank and active stream sediments from Belgium and Luxembourg
Brusselmans, A., De Vos, W., Swennen, R. and Van der Sluys, J., to be published

In this volume, the methods and results of the univariate, bivariate and multivariate statistical analysis applied to the geochemical data of the U-, L-, S-samples are grouped. Univariate statistical parameters (means, standard deviations, ranges), histograms and bivariate pearson correlation patterns are presented and commented. Differences obtained between the different populations are interpreted in terms of geochemical background signals and anthropogenic influences. Results of a principal component and factor analysis are also discussed.

Volume III - Geochemical maps of Belgium and Luxembourg based on overbank and active stream sediments
Van der Sluys, J., Brusselmans, A., De Vos W. and Swennen, R., 1997, Prof. Paper 283, 93 p.

In this volume a geographical presentation of the results of the U-, L-, S-samples is presented. Different types of site related colour maps are given: element correlation maps for each of the U-, L-, S-sample types; single element maps for pollution sensitive elements, with element contents in U-, L-, and S-sample types presented together on one map; single element proportional increase maps for pollution sensitive elements, showing the increase in element contents from the L- to the U-sample and from the L- to the S-sample. Element contents and variations were presented by means of both colour intensities and numerical values for each sampled site, to ensure an easy overview as well as to allow to infer the original data.

Volume IV - Vertical element distribution patterns in selected overbank profiles from Belgium and Luxembourg
Verkeyn, M., De Vos, W., Moons, P., Swennen, R. and Van der Sluys, J., to be published

This report is dealing with analysis results of the detailed overbank sampling which has been carried out in the framework of a research project. The geochemical distribution pattern of the vertical profiles is presented and where possible also explained. For each analysed profile relevant geological and anthropogenically related information is given.

For practical reasons, volume III had been published **before** the volumes I and II.

Apart from these volumes, results of parts of this project have been published or are submitted in various journals (see references).

2. HISTORICAL REVIEW AND OBJECTIVES OF THE WEGS' PROJECT ON "REGIONAL GEOCHEMICAL MAPPING OF WESTERN EUROPE TOWARDS THE YEAR 2000"

The geochemical survey of Belgium and Luxembourg was conducted in the framework of an international research project entitled "Regional geochemical mapping of Western Europe towards the year 2000". This project was initiated by the Working Group on Regional Geochemical Mapping (Bölviken et al., 1993), which was created in 1985 by the directors of Western European Geological Surveys (WEGS), presently the FORum of European Geological Surveys (FOREGS). The mandate of the group was to investigate different aspects of "Regional Geochemical Mapping" (Demetriades and Ottesen, 1990). Representatives from the Working Group from Austria, France, Germany, Greece, Norway, Spain and the United Kingdom met in Trondheim (Norway) in May 1986. Subsequent to discussing the directives given by the WEGS Directors, a systematic wide-spaced regional geochemical mapping programme to obtain baseline information for use in geoscientific and environmental studies, including the realistic assessment of anthropogenic pollution was decided (Bourgh et al., 1986). Based on the experience gained during the Nordkalott project (Bölviken et al., 1986) and other regional investigations, not published at that time (Ottesen et al., 1989), the Working Group proposed a regional geochemical mapping project with a density of 1 sample site per 500 km^2, i.e. a total of 9466 sites covering an area of about 4.7 million km^2 of the twenty-one WEGS countries at that time (Stenestad, 1990).

The WEGS Working Group on Regional Geochemical Mapping presented its project proposal at the Copenhagen meeting (August, 1988) of the Directors of the Western European Geological Surveys (WEGS) (Bölviken et al., 1988). A geochemical mapping of Western Europe, based on six sample types to be collected at each site was proposed. They were: (1) surface water, (2) groundwater, (3) top soil, (4) C- horizon soil, (5) composite overbank sediment and (6) active stream sediment. The practicability of taking six sample types was, however, questioned by the WEGS Directors. They decided that a Pilot Project should be carried out first (1988-1990). An inventory of already existing regional geochemical mapping in Western Europe was compiled during this period. Furthermore an assessment focusing on the scope and limitations of only two sample media, overbank and stream sediment in widely-spaced regional geochemical mapping was worked out. Based on the results of the Pilot Project, the Directors intended to make a final decision on the viability of a Main Project of regional geochemical mapping of Western Europe.

Finland and Ireland joined the Working Group in 1989. During the Pilot Project (1988-1990), and the preceding two years, a substantial amount of information was collected and evaluated. After the submission of the Pilot Project Report (Demetriades et al., 1990b) and the Project Proposal (Bölviken et al., 1990b) the WEGS Directors came to the conclusion that further research work was necessary. The Working Group was again enlarged in 1990 to include members from Belgium and The Netherlands. It continued its activities until 1992, when the Directors decided to end its work. A final report highlighting the main results and conclusions of the research work carried out between 1986-1992 and the recommended methodology for regional geochemical mapping was submitted in 1993 to the WEGS Directors (Bölviken et al., 1993).
According to the inventory made by FOREGS (Plant et al., 1996), several countries are or have been carrying out geochemical surveys based on overbank or floodplain material: Norway, Germany, the Netherlands, Hungary, Slovenia, Greece and Poland.

The Geological Survey of Belgium took the initiative to participate in the Geochemical Mapping Project, which was carried out by the Laboratory of Sediment Petrology of the Physico-chemical Geology at the Catholic University of Leuven.
This geochemical survey using overbank and active stream sediments was carried out from 1991 to 1996. In total 66 sampling sites were selected for this mapping project, their location is presented in figure 1.

This project was carried out in four stages, namely:

1) participation in the pilot project where the methodology proposed by Bölviken et al., 1990b was tested in the highly industrialised border area between Belgium, The Netherlands and Germany, in cooperation with the "Rijksgeologische Dienst" and the "Bundesanstalt für Geologie und Rohstoffe".
2) sampling and analysis of the sampling sites north of the Meuse-Sambre rivers.

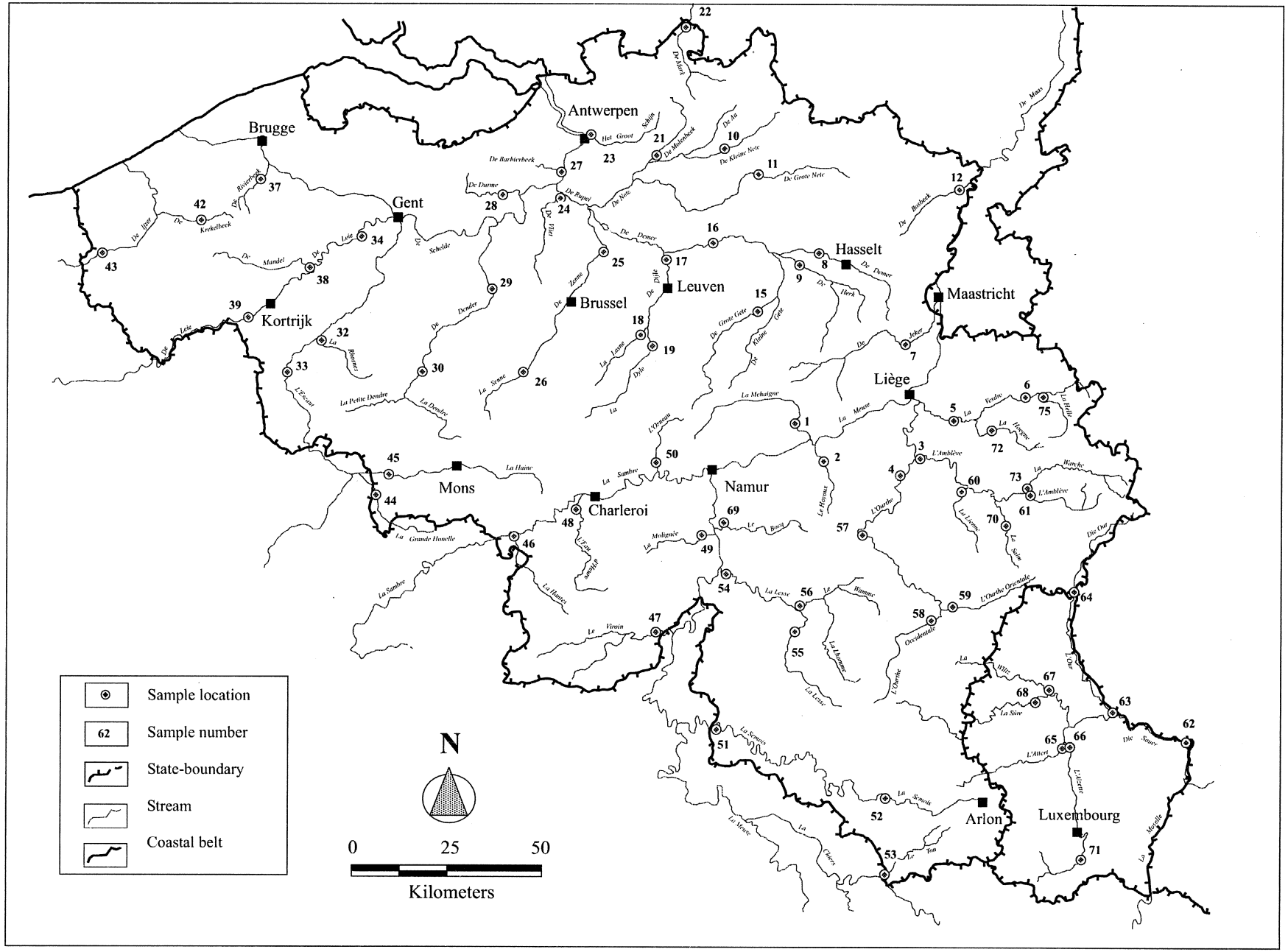

Figure 1: Location of the sample sites selected for the geochemical survey of Belgium and Luxembourg

3) sampling and analysis of the sampling sites south of the Meuse-Sambre rivers. Detailed analysis of the vertical distribution patterns of overbank profiles in northern Belgium.
4) map production and interpretations of the geochemical distribution patterns. Detailed analysis of the vertical distribution patterns of overbank profiles in southern Belgium and Luxembourg.

The methodology proposed by the Working Group was followed in this Belgian-Luxembourg project.

3. THE USE OF OVERBANK AND ACTIVE STREAM SEDIMENTS IN REGIONAL GEOCHEMICAL SURVEYS

The idea of using trace metals in stream alluvium as an exploration guide is based, according to Hawkes (1976), on the experience of Lovering et al. (1950). The latter authors used this method in 1947-48 to map the downstream dispersion of Cu, Pb and Zn from the San Manuel deposit in Arizona. From then on, stream sediment became the most extensively used sample medium in regional geochemical mapping (Meyer et al., 1979). This approach was especially powerful in recognising metallogenic provinces and in delineating areas with a high probability of hosting mineral deposits. Sample densities varied according to the requested detail, from 1 per 120 km^2 (Garrett and Nichol, 1967; Armour-Brown and Nichol, 1970) to 1 sample per 1 to 13 km^2 (Boyle et al., 1966; Govett and Hale, 1967; Band, 1969; Govett and Galanos, 1974; Smee and Ballantyne, 1976). Systematic national regional geochemical surveys generally employed a density of 1 sample per 1 to 1.6 km^2 (Smith et al., 1976; Webb et al., 1978; IGS 1978; Fauth et al., 1985; Thalmann et al., 1989; BGS, 1992). A larger sample density with 1 sample per 30 km^2 was used in the first international collaboration programme, the Scandinavian Nordkalott project (Bölviken et al., 1986).

However, on the basis of fluvial erosion processes one can question the representativity of stream sediments to evaluate upstream drainage geochemistry. It is furthermore difficult to infer processes which control the sediment composition. An evaluation of stream sediment surveys also revealed that this sampling medium may, in some

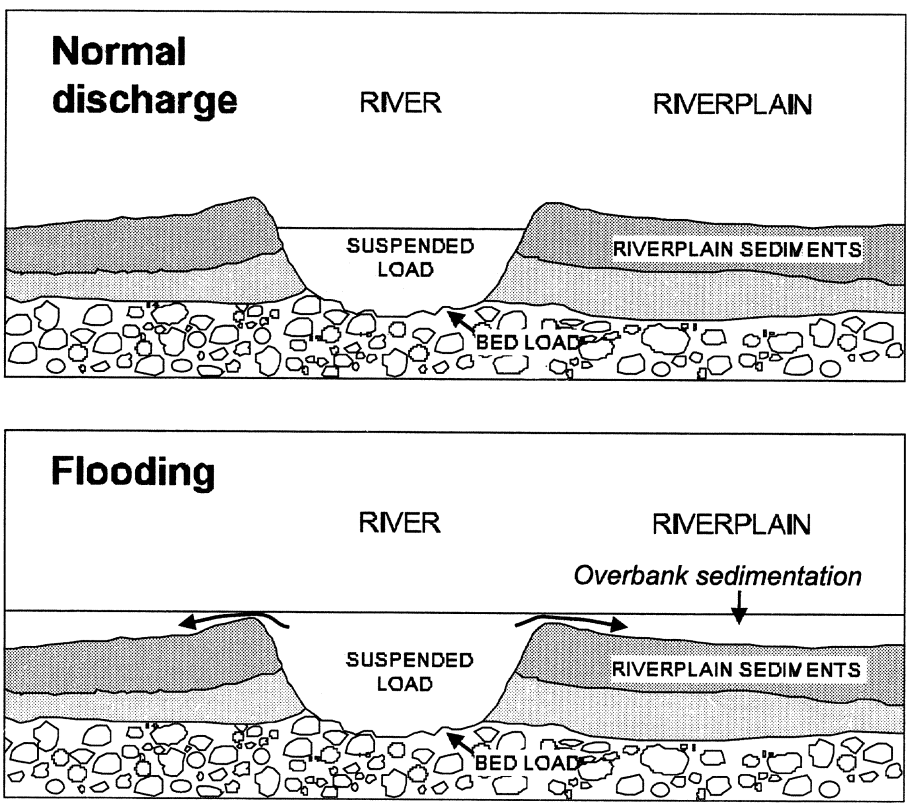

Figure 2: River drainage situation during normal discharge and flooding

areas, fail to detect existing natural distributions. This may be due the fact that (a) only a few sediment sources in a stream catchment area are active at the time of sampling (Ottesen et al., 1989; Bogen et al., 1992), and (b) the stream beds may be polluted, a situation which is very common in major parts of Europe (Ottesen et al., 1989; Macklin et al., 1994; De Vos et al., 1996; Hindel et al., 1996). Moreover, many rivers are canalised or armoured. This causes problems in stream sediment sampling. Based on these remarks the Working Group questioned whether active stream sediments were the most suitable sample medium for large areas in Europe.

Another sampling medium which was recommended for regional geochemical surveys consists of alluvial bank or floodplain sediments. Despite the early recommendations by Hawkes and Webb (1962) and Rose et al. (1979) it was only recently used on a large scale. Ottesen et al. (1989) were the first to cover the whole of Norway at a density of 1 sample per 500 km^2. Despite this rather low sampling density, results from this survey showed that meaningful large scale patterns can be obtained.

Overbank sediment is produced when the water discharge exceeds the capacity of a river channel and parts of the suspended load is deposited on the floodplain or on the river bank levees (Figure 2). Throughout a long time span, a sequence of fine-grained, often laminated material is accumulated. Each lamina in the sequence represents a single flood event. A composite overbank sediment sample, taken over a certain thickness of the sequence, integrates several layers which represent material produced during several floods.

This approach has the following advantages:

1) The representativity of the composite overbank sediment. The chemical composition of such a sample better reflects the geochemistry of the river basin than the traditional active stream sediment. This is because sediment sources are unevenly distributed across the catchment area, and the contribution from each source and their location may vary with time. During flooding nearly all sources are activated and intensively mixed. After retreat of the flood the floodplain or overbank sediment composition will clearly be very representative for the hinterland.

2) The geochemical signal within a vertical overbank profile represents a signal through time. Consequently the lowermost material in an overbank sequence may have been deposited before the onset of anthropogenic pollution, in which case it is possible to obtain samples representing pristine or at least pre-industrial conditions. However, there is always a need for correct dating at least of the lowermost sample. This can be achieved by ^{14}C-dating, pollen analysis or thermoluminescence.

3) The need for the production of a cost-effective multielement and multipurpose geochemical atlas on a continental scale demands the use of a very low sampling density (Bölviken et al., 1990b). The representativity of overbank sediment to characterise an entire drainage basin allows a lower sampling density and thus in principle a lower cost per unit area.

4) Overbank sediments are present in many drainage basins and develop under different climatic conditions. This is certainly true for large parts of Europe.

5) Overbank sediments are easy to sample and thus allow to set up a routine sampling campaign, at least if used for large scale mapping. However, if it is also the intention to infer detailed geochemical variations through time, selection of a sample locality is less obvious. In this case sampling of overbank sediments is clearly not a routine procedure.

In industrialised areas such as major parts of northern Belgium it is very likely that human interference with rivers caused large changes in the pattern of sediment sources. Modifications in the rates of overbank sedimentation are very likely. One should however distinguish activities that might have an influence on the chemical composition from influences which simply imply a decelerated or accelerated erosion and sedimentation. A general knowledge about sedimentation rates on the floodplains is therefore a prerequisite to judging the suitability of locations for collecting pristine and polluted overbank sediments. It might therefore be necessary to carry out a historical, sedimentological and geomorphological study of potential sampling locations before collecting samples. This type of work which is a prerequisite for the selection of the optimum sample site, was carried out in the framework of the present project.

4. METHODOLOGY

In the following paragraphs an overview of some of the major important recommendations which were followed in this project will be given. A thorough description of the Working Group recommendations is given in Bölviken et al. (1996). The objectives of the WEGS project were to produce a multielement and multipurpose geochemical atlas of Western Europe with a high quality homogeneous data set. Furthermore it was also the intention to establish a sample archive for future monitoring of the state of pollution. For such an international geochemical mapping programme a standardised set of methods for sampling, sample preparation and analysis should be worked out to assure the production of a high quality homogeneous data set. During all stages of the project strict assurance and quality control procedures should be guaranteed (Schermann, 1990b). Furthermore, the employed methods should enable the identification of pre-industrial natural conditions and the degree of pollution (Bölviken et al., 1990b, 1993; Darnley et al., 1995). After considerable research, the WEGS Working Group on "Regional Geochemical Mapping" recommended a standard methodology (Bölviken et al., 1996).

4.1. SAMPLING

By means of topographical maps and historical research, initially 75 sites were carefully selected in this project from drainage basins of 60 to 600 km^2 all over Belgium and Luxembourg, an area of approximately 33.000 km^2. Attention was paid to the representativity of the sites, given geological, hydrographical and topographical criteria, as well as known human influences (levees, river bed armouring, straightening of river courses, peat exploitation, mining, industries, ≡). During the on-field sampling campaigns, a certain number of these sites were omitted for reasons of sampling impracticability or lack of representativity. The final site selection therefore consists of 66 sites, which results in an average density very close to the WEGS recommendation of 1 sample site for an area of about 500 km^2. The sites are presented in figure 1 and listed in annexe 1. Annexe 2 shows detailed site locations and the description of the profiles under consideration. The site numbers vary from 01 to 75 and correspond to the originally selected site identification numbers. To correspond to the WEGS international conventional numbering, they should be preceded by the number 110, which refers to the Belgium and Luxembourg territories.

The sampling within the framework of this project took place in different periods during the summer months between June 1991 and September 1994 (Table 1). During the first sampling campaign the samples for the pilot project were taken in the border area with Germany and The Netherlands, during the second those from the northern part of Belgium (north of the Meuse-Sambre river line) and during the third part those from the remaining southern part of Belgium and Luxembourg.

Sites	Sampling period	Analysis period	
		L-, U-, S- samples	Detailed overbank samples
1-12	07/91 - 08/91	12/91	/
15-45	07/92 -11/92	04/93	11/94
46-75	06/94 - 11/94	03/95	04/95

Table 1: Sampling and chemical analysis periods of the three field campaigns

At each sampling location at least one vertical overbank sediment profile pit was dug in the immediate vicinity of the river, to the depth of the river and/or the ground water level (see figure 4). Three different samples have been collected, namely (figure 3):

1) an overbank sediment sample within the lowermost part of a profile. This is the so-called **L-sample**. This sample should in principle be free from human influences. It should allow to map natural geochemical variations;

2) a near surface or upper overbank sediment below the humic A-horizon (0 to 15 cm). This so-called **U-sample** will be used to assess anthropogenic impacts on the environment (river- and air-borne pollution). In the Belgian

- Luxembourg project the depth interval of 5 to 25 cm was systematically taken since (a) the rooted topsoil was avoided and (b) experience gained during the project showed that this depth interval often corresponded to the sedimentation period of the last two centuries;

3) an active stream sediment. This sample is taken for the assessment of present-day anthropogenic pollution. It should, furthermore, facilitate linkage with other national and international regional geochemical data sets (Schermann et al., 1990a; Bölviken et al., 1993). This so-called **S-sample** was always collected as close as possible to the overbank sediment site.

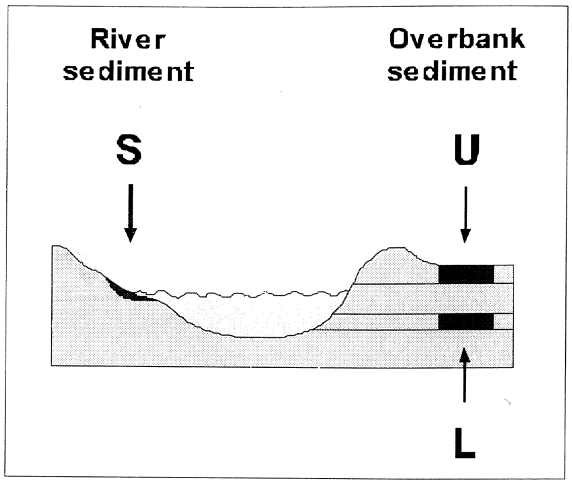

Figure 3: The L-, U-, S-sample types

Enough material was collected for each sample type (± 5-10 kg), to allow a minimum of 0.5 kg of the <125 ìm grain size fraction (preferably 1-2 kg) for analysis and storage. Contrary to the recommendation of the Working Group no extra smaller sample of the U-L-S-medium was collected for determination of Hg. However, if organic rich layers were present in the overbank sediment profile, they were separately sampled for ^{14}C-dating.

Simultaneously with the collection of the U-L-S-samples, a detailed sampling of the vertical profiles was carried out to deduce, in the framework of a research project, the vertical geochemical distribution patterns. Samples were taken over 10 to 20 cm intervals taking into account lithological variations.

4.2. SAMPLE PREPARATION

Collected samples were subsequently sent to the Laboratory of Sediment Petrology of the Physico-chemical Geology Section (K.U.Leuven) for air drying in a contamination-free environment. An attempt was made not to keep samples (particularly stream sediment) in bags for prolonged periods of time, since this could cause oxidation of sulphides, algal growth, etc. (see instructions by Schermann et al., 1990a). For most of the samples air drying started within 2 days after sampling.

Samples of the U-L-S series were subsequently dried at a temperature of 80 °C during 48 hours. Those from the detailed sampling of the research project were dried at 40°C over several days. This temperature was used to avoid destruction of certain clay minerals. The entire dried sample was then carefully disaggregated in a porcelain mortar. Fine roots, large stones, brick fragments and glass particles were removed by hand picking. The disaggregated sample was subsequently dry-sieved through nylon or stainless steel screens, so that the < 125 ìm fraction could be collected. About 0.5 kilogram of material was kept for future use. This sample was then split into (1) an analytical subsample and (2) a sample to be stored in a domestic archive.

For the samples taken for inferring the detailed vertical distribution patterns, a similar sample preparation was followed and also the <125ìm size fraction was analysed (see Verkeyn et al., 1996).

4.3. STORAGE OF SAMPLES

The Working Group conceived that the overbank and stream sediment samples represented a unique reference collection, which has to be carefully stored for future monitoring purposes in a contamination-free environment. According to the WEGS Open File Reports two types of chemical alteration are likely to occur in geochemical samples, from the moment that they are stored outside their natural environment. First of all oxidation and other chemical reactions caused by air or chemical and/or biological agents within the samples might occur. This can, however, be minimised by storing at low temperatures. However, cooled domestic storage facilities are not at our disposition so that the samples are now stored at room temperature. Secondly contamination from sample containers, air dust or water could happen. This effect was reduced by storing samples in PVC and glass containers. Handling and storage occurred under non-polluting conditions.



Figure 4: Example of a typical overbank profile section: site 11015 - Grote Gete

4.4. ANALYSIS

The intention of the Working Group was to distribute the analytical work among a few reputable laboratories. Analysis of all samples for the same suite of elements by the same analytical method should be undertaken by each laboratory. This should avoid the problems of data incompatibility and interlaboratory calibration of samples.
The original proposal of the Working Group was to analyse 70 elements, e.g., Li, Be, B, N, F, Na, Mg, Al, Si, P, S, K, Ca, Sc, Ti, V, Cr, Mn, Fe, Co, Ni, Cu, Zn, Ga, Ge, As, Se, Br, Rb, Sr, Y, Zr, Nb, Mo, Pd, Ag, Cd, In, Sn, Sb, Te, I, Cs, Ba, Hf, Ta, W, Pt, Au, Hg, Tl, Pb, Bi, Th, U, La, Ce, Pr, Nd, Sm, Eu, Gd, Tb, Dy, Ho, Er, Tm, Yb and Lu (Hindel and Wippermann, 1990; Demetriades, 1996). Sequential extraction methods should also be considered in the analytical scheme. The quality control procedure recommended by Schermann (1990b) should be followed.

In this project 100g of the < 125 ìm grain-size fractions of both overbank and the stream sediments was analysed by the geochemical laboratory of the "Bundesanstalt für Geowissenschaften und Rohstoffe" in Hannover, Germany under supervision of U. Siewers. This was one of the reference laboratories selected by the Working Group. Some 37 elements were analysed by X-Ray Fluorescence (XRF), after measuring LOI at 1000°C. One gram of the <125 ìm fraction was subsequently mixed with 5 grams of $LiBO_2/Li_2B_4O_7$ and fused at 1300°C. The elements determined on the fused beads are listed in table 2. According to U. Siewers the analytical results of SO_3, As, Cl and F are less accurate. Additionally flame-AAS was used for reanalysing Cd and As at the Laboratory of Physico-Chemical Geology (K.U.Leuven). The Walkley & Black method was used for the determination of the organic matter content. The results of the analysis are given in annexe 2.
As the site sampling took place in 3 successive sampling campaigns, the sample analysis also did. The periods of analysis for the 3 successive sample collections are presented in table 1. For the XRF analysis apparatus had improved between the second and the third analysis campaign. Furthermore 4 supplementary elements were analysed during the latter campaign. They are listed in italics in table 2. Another effect of this technical improvement is the lowering of the detection limit for some elements.

For budgetary reasons, only 34 of the 66 sampled profiles were selected to be analysed in detail. These sites are also indicated in figure 1 and in annexe 1. The < 125ìm fraction of these samples was analysed in the Chemex Labs Ltd., Vancouver (Canada), by X-Ray Fluorescence (XRF) and Induced Coupled Plasma - Atomic Emission Spectrometry (ICP-AES), for the elements described in table 2. The results of the analysis are presented and discussed in detail in volume IV (Verkeyn et al., in preparation).

Analysed elements	Analysis technique	Laboratory
L-, U-, S-samples		
SiO_2, TiO_2, Al_2O_3, Fe_2O_3, MnO, MgO, CaO, Na_2O, K_2O, P_2O_5, SO_3, (As), Ba, Ce, Co, Cr, Cs, Cu, Ga, Hf, La, Mo, Nb, Ni, Pb, Rb, Sc, Sn, Sr, Ta, Th, U, V, W, Y, Zn and Zr; *F, Cl, Bi and Sb*	XRF	Bundesanstalt für Geowissenschaften und Rohstoffen, Hannover (Germany)
Cd and As	Flame-AAS	Afdeling Fysico-Chemische Geologie, K.U. Leuven (Belgium)
Org C	Walkley & Black	
Detailed overbank profile samples		
Al_2O_3, CaO, Cr_2O_3, Fe_2O_3, K_2O, MgO, MnO, Na_2O, P_2O_5, SiO_2, TiO_2, Ba, Rb, Sr, Nb, Zr and Y	XRF	Chemex Labs Ltd., Vancouver (Canada)
Ag, Al, As, Ba, Be, Bi, Ca, Cd, Co, Cr, Cu, Fe, Ga, Hg, K, La, Mg, Mn, Mo, Na, Ni, P, Pb, Sb, Sc, Sr, Ti, Tl, U, V, W and Zn	ICP-AES	

Table 2: Chemical analysis of the L-U-S-series and detailed overbank profile samples

4.5. PRESENTATION, INTERPRETATION AND UTILIZATION OF RESULTS

The Working Group proposed to present the data as (1) single element point source maps in black and white; (2) single element moving median maps in colour, and (3) derivative maps showing, for example, the present state of pollution (Salminen and Bölviken, 1990) or other relationships.

It was also proposed that interpretations should accompany the maps of individual chemical elements, as well as multielement maps, possibly prepared using statistical methods. One of the aims of the interpretation was to convey important features of element distribution to non-geochemists. These following aspects should be covered:

Geology. For each element crustal abundance values and other reference data should be given in a brief general description. Relationships between the distribution of each element and geology, i.e. lithological substrate should be adressed. Variations in the normal background content in relation to differences between the main tectonic provinces in Europe should also be described.

Economic Geology. Evidence of the presence and role of geochemical provinces and districts and their possible relation to ore occurrences should be briefly reviewed with particular reference to potential crustal reserves for ore forming elements such as Au, Sn, Pb and Zn.

Quaternary Geology. Wherever possible information should be provided on the geochemistry of Quaternary formations, which cover much of lowland Europe. These data will also provide information of Pleistocene glacial and fluvioglacial deposits over Western Europe in general.

Surface Environment. The theoretical behaviour of elements in the surface environment and their mobility under different Eh-pH conditions should be highlighted, before describing some main areas, thought to be affected by contamination. The data should be represented in such a way that the relation to variations identified in the natural background should be clear. Suggestions on the potential significance of areas with exceptionally high and low concentrations of elements for environmental, epidemiological and agricultural studies and land use planning should be worked out. Differences between results observed on surficial and deep overbank sediment samples should be used to estimate possible occurrences of pollution, but still according to the Working Group no statements should be made concerning their source.
The generated data sets should be presented in such a way that they are useful in many research areas, such as pollution studies, geomedicine, agriculture, forestry, water resources and land use planning, crustal development and metallogenic studies, etc. (Bölviken et al., 1990a, 1990c)

The results obtained from the chemical analyses of the U-, L- and S-samples in this project were statistically processed by means of univariate, bivariate and multivariate statistical techniques, to analyse the distribution patterns and correlations of the different elements in the different sample types, in relation to geology and pollution patterns. These data will be presented in volume II (Brusselmans et al., 1997b). Finally, the elements were mapped by means of single element and correlated element site location colour maps, using a Mapinfo GIS software package. Existing maps of the geology and known mineralisations of Belgium and Luxembourg were digitised and presented on the same scale as the element site location colour maps, to facilitate interpretations in terms of background geochemical signals. They are given in volume III (Van der Sluys et al., 1997).

The results obtained from the chemical analysis of the detailed overbank sediment profiles were also statistically processed by means of univariate and bivariate statistical techniques, to analyse the element distribution patterns and correlations in the total dataset and in the different profiles, in relation to geology and pollution patterns. The vertical distribution of the elements was presented graphically for each profile and interpreted with respect to collected detailed baseline information in relation to the geology, the pedology and the industrial and agricultural activities in each upstream watershed. These data are presented in volume IV (Verkeyn et al., in preparation).

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ANNEXES

Annexe I

List of the sampled rivers

Site number	River name	Locality	Samples				Sampling date	Site Coordinates	
			U	L	S	Det.			
11001	Mehaigne	Huccorgne	x	x	x	d	01/08/91	50° 33' 41" N	05° 10' 16" E
11002	Hoyoux	Roiseu	x	x	x	d	31/07/91	50° 28' 13" N	05° 16' 12" E
11003	Amblève	Halleux	x	x	x	d	17/07/91	50° 29' 07" N	05° 37' 00" E
11004	Ourthe	Hamoir	x	x	x	d	16/07/91	50° 26' 36" N	05° 32' 07" E
11005	Vesdre (1)	Fraipont	x	x	x	d	17/07/91	50° 34' 06" N	05° 43' 08" E
11006	Vesdre (2)	Membach	x		x	d	02/08/91	50° 36' 49" N	05° 59' 26" E
11007	Geer	Glons	x	x	x	d	13/08/91	50° 44' 56" N	05° 33' 42" E
11008	Demer (1)	Kermt	x	x	x	d	14/10/91	50° 57' 40" N	05° 15' 26" E
11009	Herk	Herk-de-Stad	x	x	x	d	15/07/91	50° 55' 48" N	05° 12' 32" E
11010	Kleine Nete	Lichtaart	x	x	x	d	29/07/91	51° 12' 18" N	04° 55' 38" E
11011	Grote Nete	Meerhout	x	x	x	d	14/08/91	51° 08' 41" N	05° 03' 33" E
11012	Bosbeek	Maaseik	x	x	x	d	12/08/91	51° 05' 37" N	05° 46' 02" E
11015	Grote Gete	Neerlinter	x	x	x	**d**	29/07/92	50° 49' 37" N	05° 01' 34" E
11016	Demer (2)	Langdorp	x	x	x	**d**	18/08/92	50° 59' 37" N	04° 52' 17" E
11017	Dijle (1)	Rotselaar	x	x	x	**d**	30/07/92	50° 57' 44" N	04° 42' 16" E
11018	Laan	Terlanen	x	x	x	d	19/07/92	50° 46' 35" N	04° 37' 08" E
11019	Dyle (2)	Gastuche	x	x	x	**d**	19/07/92	50° 44' 21" N	04° 39' 04" E
11021	Molenbeek	Viersel	x	x	x	**d**	15/09/92	51° 11' 21" N	04° 39' 40" E
11022	Mark	Meersel-Dreef	x	x	x	d	16/09/92	51° 29' 17" N	04° 46' 30" E
11023	Groot Schijn	Deurne	x	x	x	**d**	02/10/92	51° 12' 53" N	04° 29' 01" E
11024	Vliet	Puurs	x	x	x	**d**	26/08/92	51° 06' 03" N	04° 18' 15" E
11025	Zenne (1)	Weerde	x	x	x	**d**	08/09/92	50° 58' 09" N	04° 28' 41" E
11026	Senne (2)	Tubize	x	x	x	d	20/08/92	50° 40' 54" N	04° 11' 01" E
11027	Barbierbeek	Bazel	x	x	x	d	21/10/92	51° 09' 18" N	04° 18' 27" E
11028	Durme	Hamme	x	x	x	**d**	09/09/92	51° 06' 10" N	04° 07' 03" E
11029	Dender (1)	Denderleeuw/Welle	x	x	x	**d**	24/08/92	50° 54' 07" N	04° 04' 27" E
11030	Dendre (2)	Papignies	x	x	x	**d**	14/09/92	50° 41' 07" N	03° 49' 48" E
11032	Rhosnes	Escanaffles	x	x	x	**d**	27/08/92	50° 45' 19" N	03° 27' 47" E
11033	Escaut (Scheldt)	Pecq	x	x	x	**d**	16/10/92	50° 40' 09" N	03° 21' 26" E
11034	Leie (1)	Nazareth	x	x		**d**	21/08/92	50° 59' 39" N	03° 35' 41" E
11037	Rivierbeek	Nieuwenhove	x	x	x	**d**	26/10/92	51° 07' 37" N	03° 14' 08" E
11038	Mandel	Wakken	x	x	x	**d**	25/08/92	50° 55' 17" N	03° 24' 59" E
11039	Leie (2)	Wevelgem	x	x	x	**d**	05/11/92	50° 48' 40" N	03° 12' 01" E

Det. = detailed overbank profile samples

x,d = sampled; **x,d** = sampled and submitted to chemical analysis

Site number	River name	Locality	Samples				Sampling date	Site Coordinates	
			U	L	S	Det.			
11042	Krekelbeek	Handzame	**x**	**x**	**x**	**d**	07/11/92	51° 01' 31" N	03° 00' 57" E
11043	Ijzer	Stavele	**x**	**x**	**x**	d	17/09/92	50° 56' 43" N	02° 40' 08" E
11044	Grande Honelle	Baisieux	**x**	**x**	**x**	d	10/09/92	50° 23' 23" N	03° 41' 20" E
11045	Haine	St. Ghislain	**x**	**x**	**x**	**d**	11/09/92	50° 26' 36" N	03° 44' 22" E
11046	Hantes	Erquelinnes	**x**	**x**	**x**	d	27/06/94	50° 18' 03" N	04° 10' 30" E
11047	Viroin	Treignes	**x**	**x**	**x**	**d**	20/06/94	50° 05' 18" N	04° 40' 05" E
11048	Eau d'Heure	Charleroi	**x**	**x**	**x**	d	20/07/94	50° 22' 24" N	04° 23' 28" E
11049	Molignée	Anhée	**x**	**x**	**x**	d	06/07/94	50° 19' 00" N	04° 50' 35" E
11050	Orneau	Jemeppe-sur-Sambre	**x**	**x**		d	15/07/94	50° 28' 32" N	04° 40' 40" E
11051	Semois (1)	Vresse-sur-Semois	**x**	**x**	**x**	d	12/08/94	49° 52' 47" N	04° 52' 22" E
11052	Semois (2)	Chiny	**x**	**x**	**x**	d	27/07/94	49° 42' 30" N	05° 27' 35" E
11053	Ton	Lamorteau	**x**	**x**		**d**	10/08/94	49° 31' 24" N	05° 27' 30" E
11054	Lesse (1)	Dinant	**x**	**x**	**x**	d	07/07/94	50° 13' 44" N	04° 54' 45" E
11055	Lesse (2)	Tellin	**x**	**x**	**x**	d	15/06/94	50° 05' 15" N	05° 09' 50" E
11056	Lomme	Rochefort	**x**	**x**	**x**	d	12/07/94	50° 08' 19" N	05° 09' 50" E
11057	Ourthe (2)	Hotton	**x**	**x**	**x**	d	23/06/94	50° 18' 19" N	05° 23' 27" E
11058	Ourthe Occidentale	Bertogne	**x**	**x**	**x**	**d**	05/07/94	50° 06' 29" N	05° 39' 40" E
11059	Ourthe Orientale	Houffalize	**x**	**x**	**x**	d	05/07/94	50° 08' 06" N	05° 43' 27" E
11060	Lienne	Târgnon	**x**	**x**	**x**	**d**	16/08/94	50° 24' 32" N	05° 46' 12" E
11061	Amblève	Bellevaux	**x**	**x**	**x**	**d**	22/09/94	50° 23' 16" N	05° 59' 53" E
11062	Sûre (1)	Rosport	**x**	**x**	**x**	**d**	11/10/94	49° 48' 06" N	06° 29' 41" E
11063	Our (1)	Wallendorf	**x**	**x**	**x**	d	04/10/94	49° 52' 45" N	06° 16' 42" E
11064	Our (2)	Ouren	**x**	**x**	**x**	d	23/08/94	50° 07' 54" N	06° 08' 07" E
11065	Attert	Colmar-Berg	**x**	**x**	**x**	**d**	12/10/94	49° 47' 02" N	06° 04' 35" E
11066	Alzette (1)	Colmar-Berg	**x**	**x**	**x**	**d**	13/10/94	49° 47' 38" N	06° 05' 50" E
11067	Wiltz	Goebelsmühle	**x**	**x**	**x**	**d**	05/10/94	49° 55' 24" N	06° 02' 56" E
11068	Sûre (2)	Goesdorf	**x**	**x**	**x**	**d**	05/10/94	49° 54' 57" N	05° 59' 28" E
11069	Bocq	Yvoir	**x**	**x**	**x**	**d**	01/07/94	50° 20' 24" N	04° 54' 32" E
11070	Salm	Grand-Halleux	**x**	**x**	**x**	**d**	29/06/94	50° 19' 10" N	05° 54' 40" E
11071	Alzette(2)	Roeser	**x**	**x**	**x**	**d**	18/10/94	49° 31' 54" N	06° 08' 33" E
11072	Hoegne	Sâsserotte	**x**	**x**	**x**	**d**	22/10/94	50° 31' 34" N	05° 50' 55" E
11074	Warche	Bellevaux	**x**	**x**		**d**	23/09/94	50° 23' 31" N	05° 59' 20" E
11075	Helle	Eupen	**x**	**x**	**x**	d	19/11/94	50° 36' 22" N	06° 03' 04" E

Det. = detailed overbank profile samples

x,d = sampled; **x,d** = sampled and submitted to chemical analysis

Annexe II

Site location and detailed description of each of the sampled overbank profiles

Site location and detailed description of each of the sampled overbank profiles

For each of the sampled overbank profiles a detailed description of the sampling location as well as of the lithological variations is given. Each site is located by means of a topographical map on a 1:50000 or 1:25000 scale. Drawings of the described overbank sediment profiles, on a scale of approximately 1:10, will illustrate the detailed descriptions. The layout of these overbank sediment profiles is given in figure 1. The position of the collected U- and L-samples, as well as the position of the samples taken over the entire vertical profile will be given. The legend of the profile drawings is presented in figure 2.

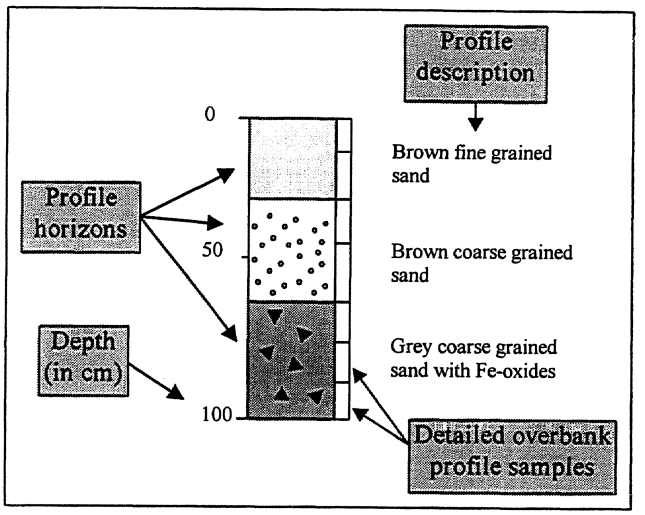


Figure 1: Clarification of the overbank profile drawing presentation

As already mentioned, a list of the sampled rivers and the co-ordinates of the corresponding sampling sites can be found in annexe I. The results of the geochemical analysis of the L-U-S-samples are given in annexe III. Results of the detailed overbank profile samples will be presented and discussed in volume IV (Verkeyn et al., to be published).

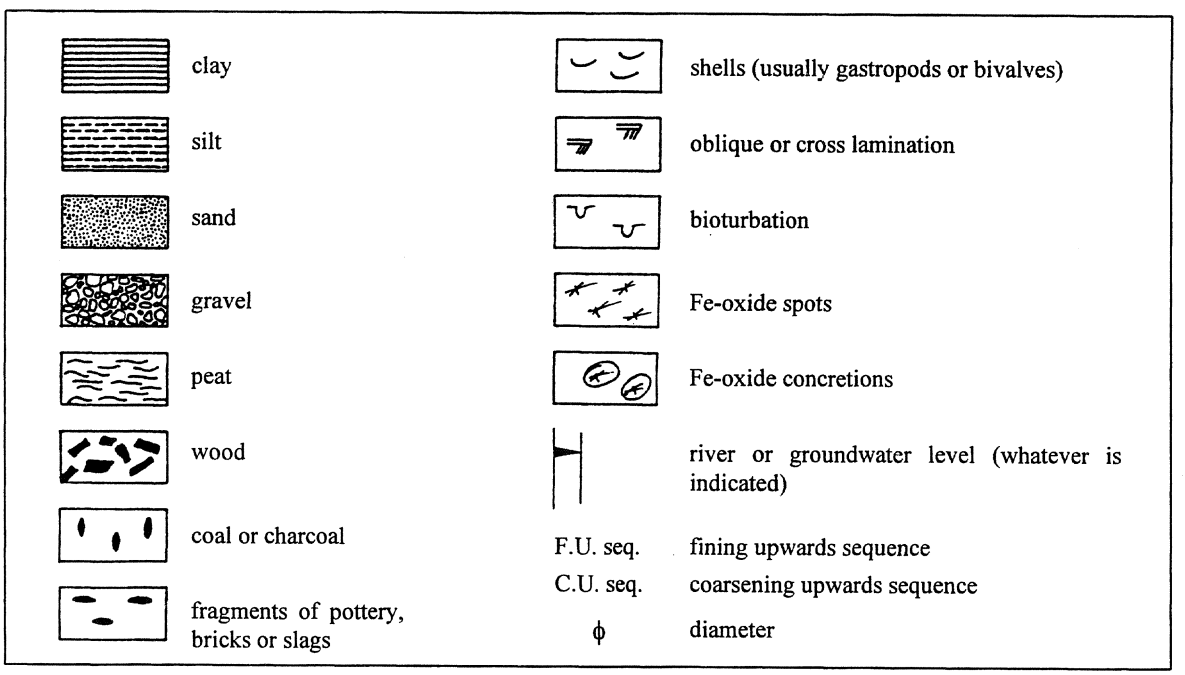
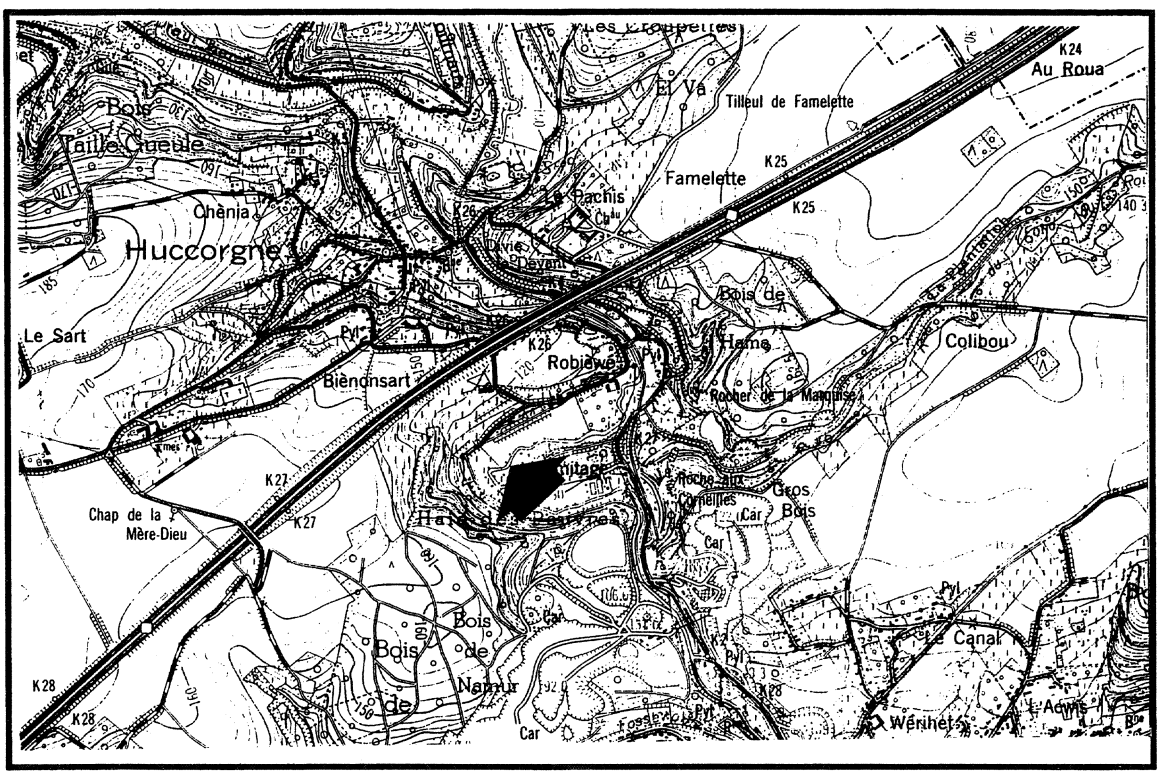


Figure 2: Legend of the overbank profile drawings

Mehaigne **Profile 11001**

Sampling location

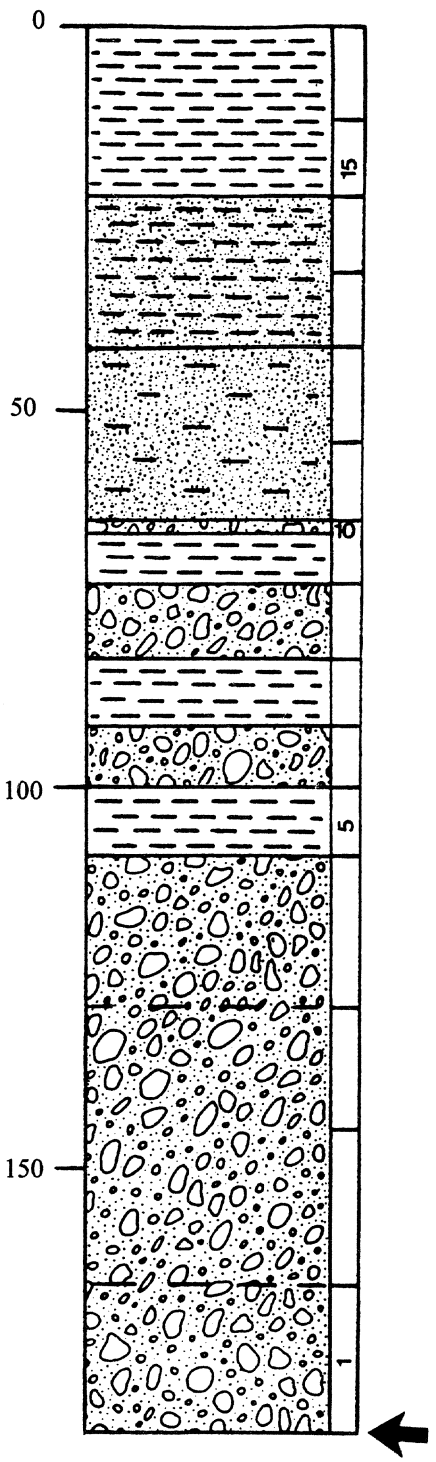
This sampling-site is located approximately 750 m south-south-east of the church of Huccorgne, near the E41 highway between Namur and Liège. Huccorgne is situated at some 10 km north-west from Huy, in the western part of the province of Liège.



Coordinates:	50° 33' 41''	N	Map scale:	(1:25000)
	05° 10' 16''	E	Map number:	41/5-6
Altitude:	92	m	Date:	01/08/1991

Mehaigne **Profile 11001**

Profile description



0-22cm : Organic-rich brown silt

22-42cm : Brown sandy silt

42-65cm : Homogeneous light brown silty sand. In lowermost part pebble layer. Matrix between pebbles consists of sandy silt

65-73cm : Light brown silt

73-83cm : Coarse pebble layer. Matrix consists of light brown sandy silt

83-91cm : Light brown silt

91-98cm : Coarse pebble layer. Matrix consists of light brown sandy silt

98-109cm : Light brown silt with slag fragments

109-185cm : Coarse pebble layer with brown silt matrix in upper part, dark brown coarse sand in middle part and light brown clay in lower part

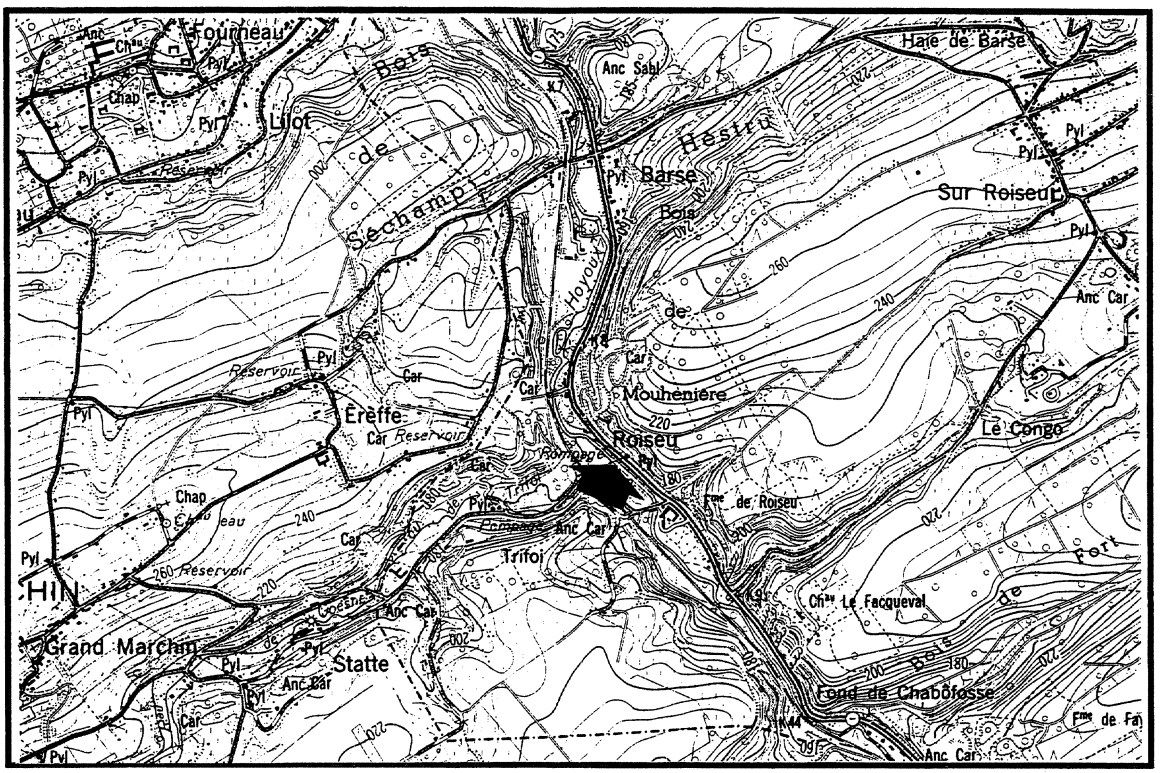
U-sample: 22-42 cm

L-sample: 100-109 cm

Hoyoux **Profile 11002**

Sampling location

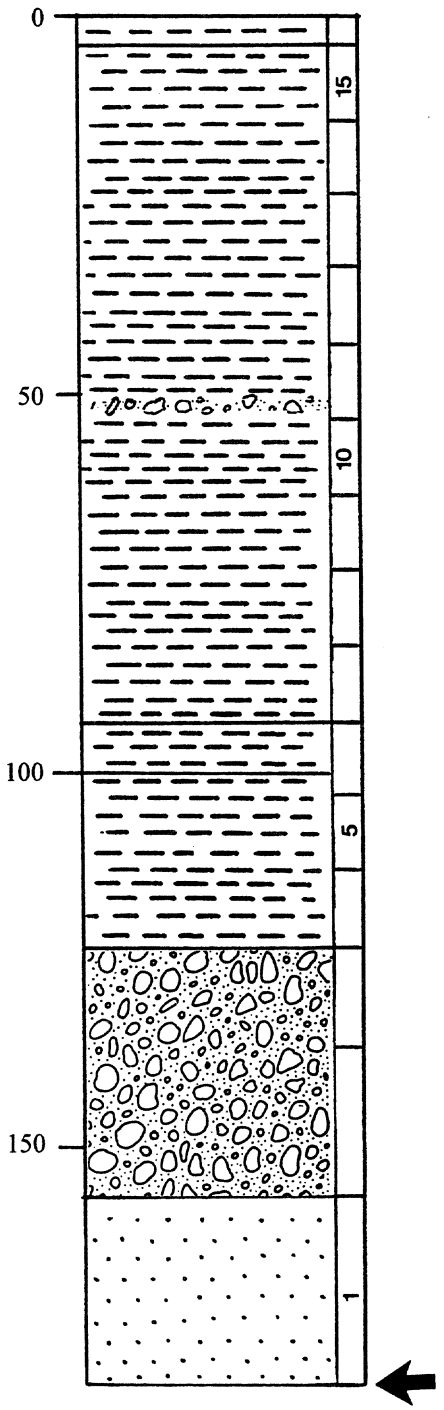
This sampling-site is located approximately 250 m north-west of the 'Ferme de Roiseu' in Roiseu, which is situated at some 6 km south-south-east from Huy, in the western part of the province of Liège.



Coordinates:	50° 28' 13''	N	Map scale:	(1:25000)
	05° 16' 12''	E	Map number:	48/3-4
Altitude:	155	m	Date:	31/07/1991

Hoyoux **Profile 11002**

Profile description



0-4cm : Organic-rich dark brown silt

4-104cm : Homogeneous brown silt with few carbonate particles. In the middle part a thin pebble layer (ϕ 1cm)

104-125cm : Brown clayey silt with carbonates and Fe-oxide particles

125-162cm : F.U.-seq. in coarse pebble layer (ϕ 20cm in lower part and ϕ 5-10cm in upper part) in brown calcareous clay matrix with dispersed Fe-oxide spots

162-182cm : Calcareous brown coarse sand with limestone fragments up to ϕ 3-4cm

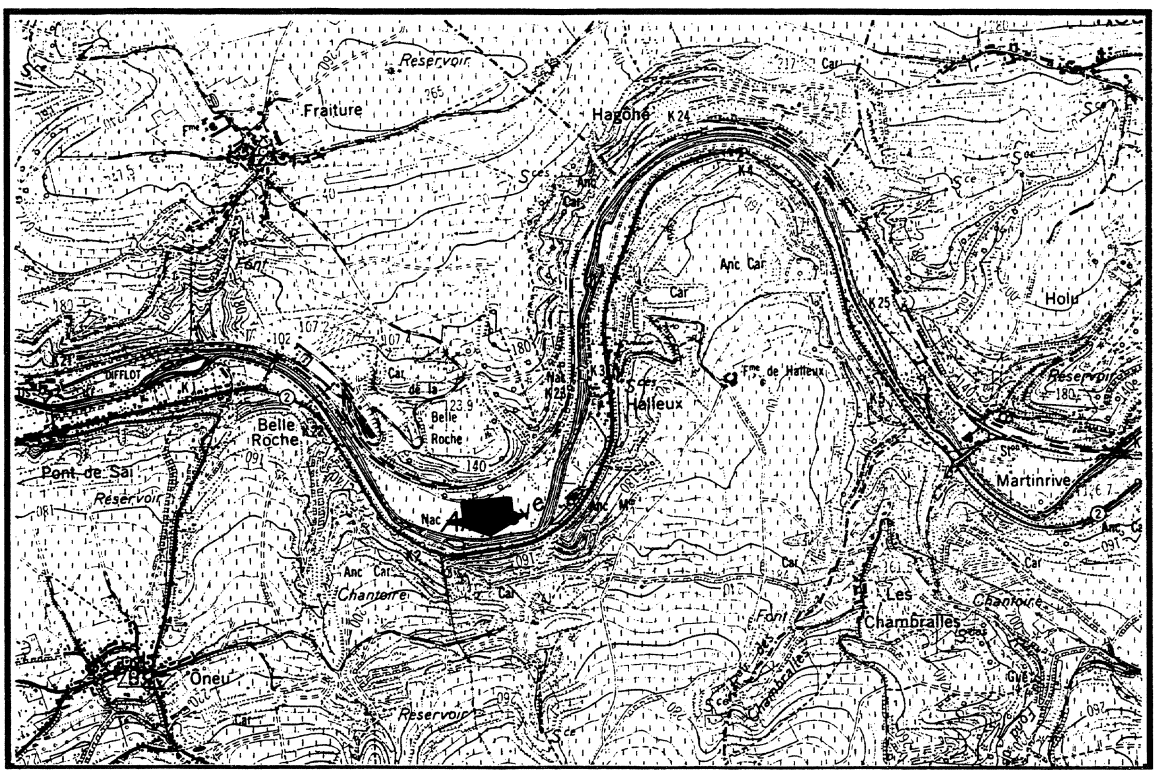
U-sample: 12-32 cm

L-sample: 94-124 cm

Amblève **Profile 11003**

Sampling location

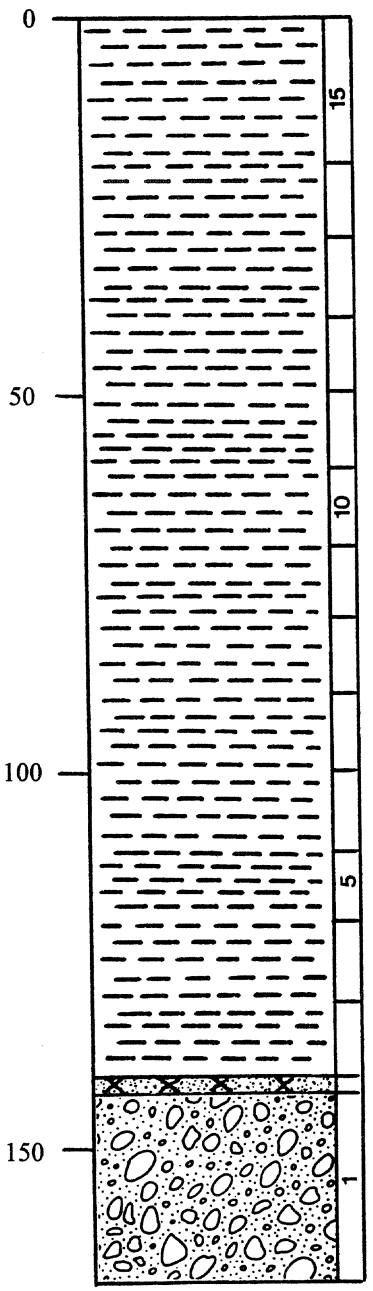
This sampling-site is located approximately 1,5 km south-east of the church of Fraiture and 3 km east of Comblain-au-Pont, which is situated at some 16 km south-south-east from Liège.



Coordinates:	50° 29' 07''	N	Map scale:	(1:25000)
	05° 37' 00''	E	Map number:	49/1-2
Altitude:	120	m	Date:	17/07/1991

Amblève **Profile 11003**

Profile description



0-141cm : Brown silt with dispersed charcoal fragments and coarse pebbles

141-143cm : Medium to coarse grained sand layer with Fe-precipitates

143-170cm : Poorly sorted conglomerate (fragments up to ϕ 30cm) in coarse sand matrix. In matrix charcoal, slag and brick fragments locally occur

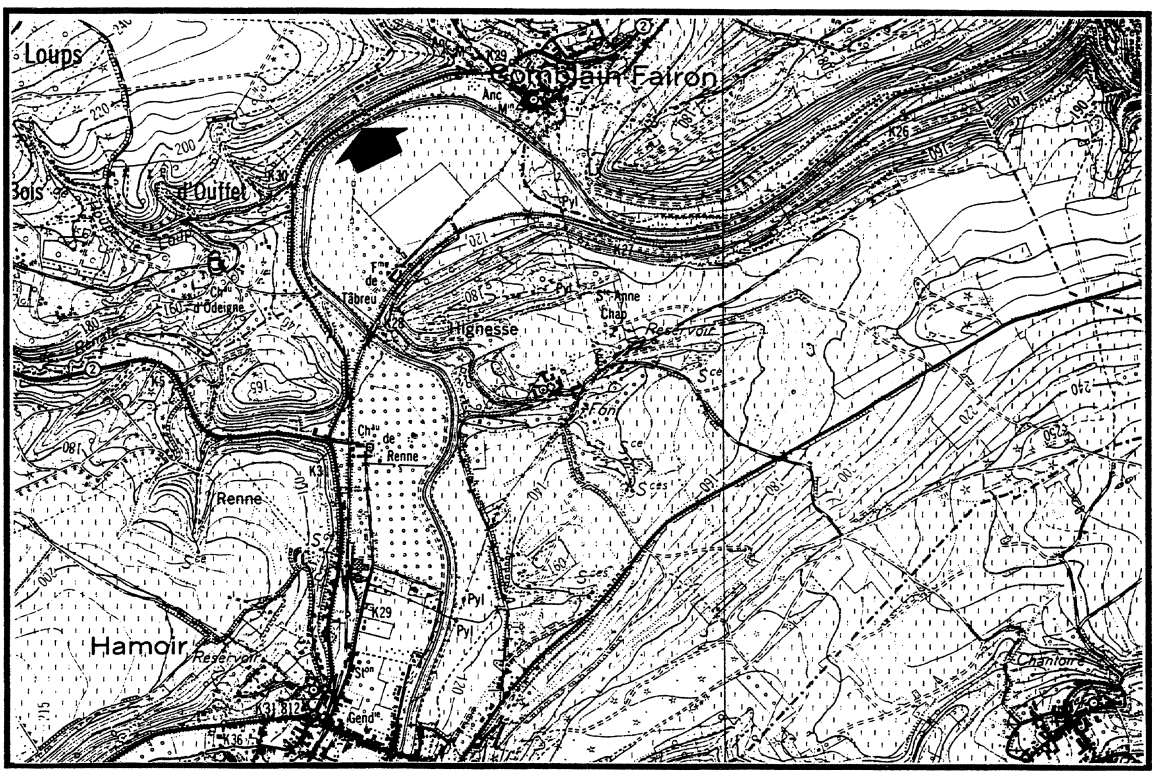
U-sample: 68-110 cm

L-sample: 143-163 cm

Ourthe **Profile 11004**

Sampling location

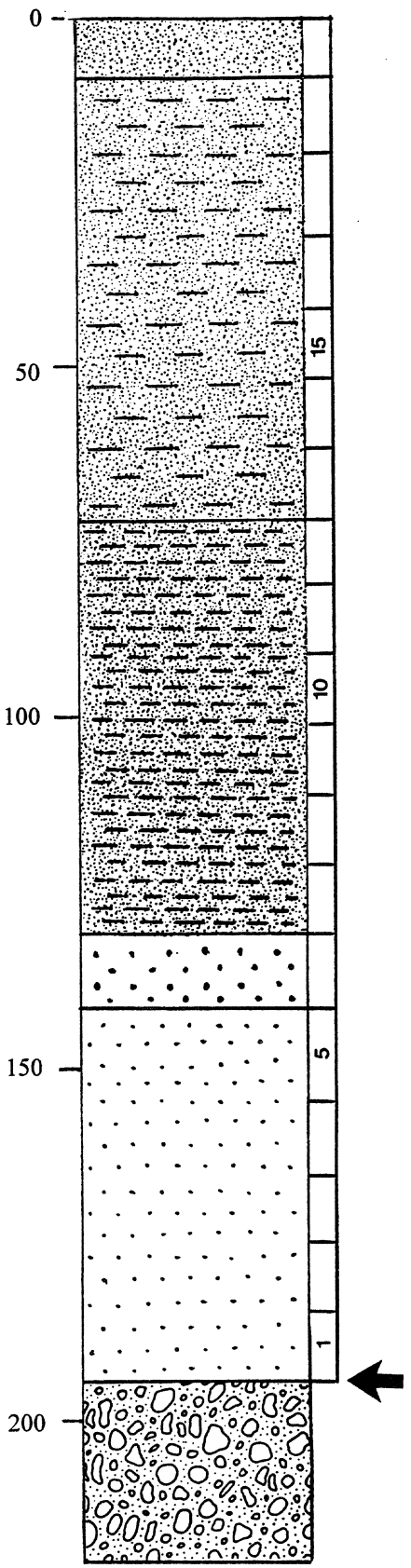
This sampling-site is located approximately 1.8 km north of the church of Hamoir, which is situated at some 20 km south from Liège.



Coordinates:	50° 26' 36''	N	Map scale:	(1:25000)
	05° 32' 07''	E	Map number:	49/5-6
Altitude:	113	m	Date:	16/07/1991

Ourthe **Profile 11004**

Profile description



0-10cm : Grey brown medium sand with calcareous spots and bioturbation. Rootzone.

10-70cm : C.U.-seq. of dark silty sand with coal fragments

70-130cm : C.U.-seq. of homogeneous light brown sandy silt with coal fragments

130-140cm : Brown coarse sand with medium pebbles

140-195cm : Homogeneous brown coarse sand with coal fragments and Fe-oxide spots in upper part

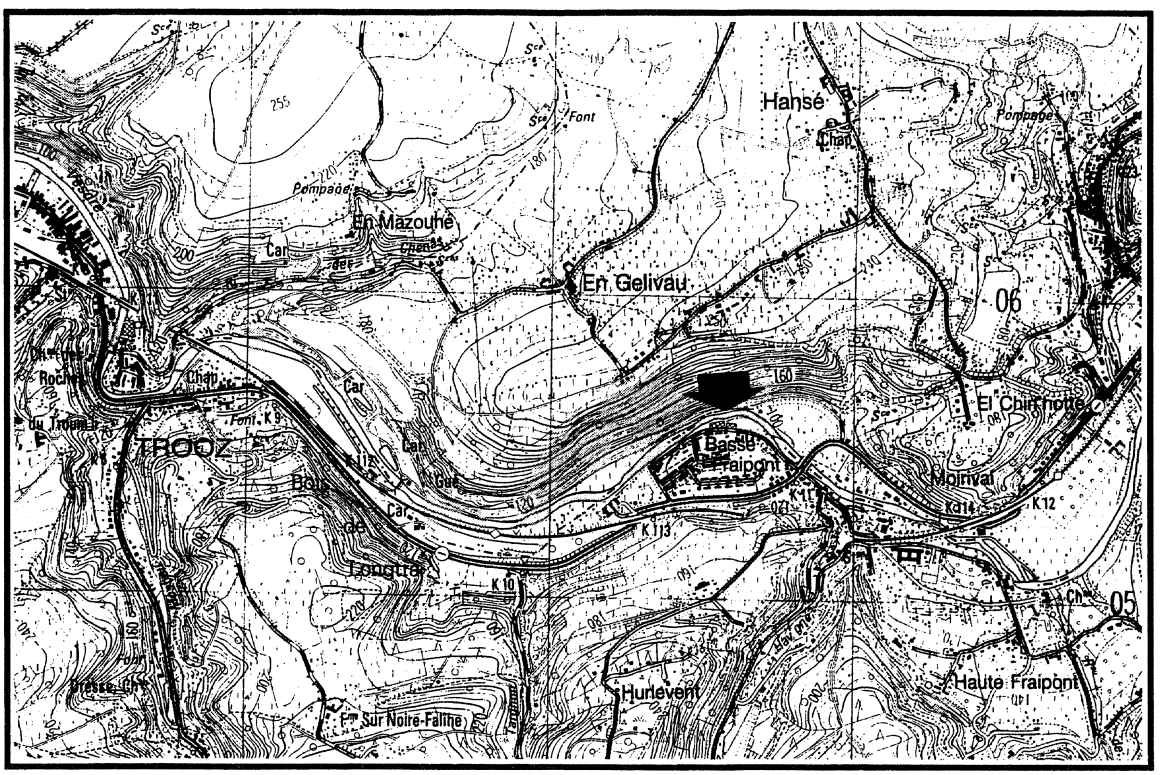
195-220cm : Coarse pebble layer

U-sample: 10-30 cm

L-sample: 175-195 cm

Sampling location

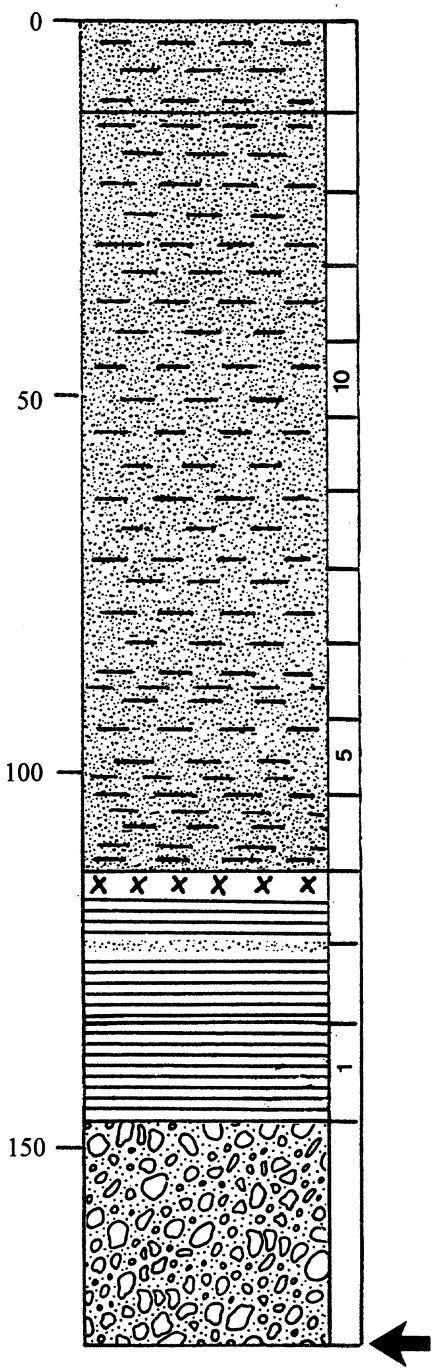
This sampling-site is located approximately 1 km south-south-west of the chapel of Hanse, near Fraipont which is situated at some 15 km east-south-east from Liège.



Coordinates:	50° 34' 06''	N	Map scale:	(1:25000)
	05° 43' 08''	E	Map number:	42/7-8
Altitude:	100	m	Date:	17/07/1991

Vesdre **Profile 11005**

Profile description



0-12cm : Dark brown silty sand, locally rooted and organic-rich

12-113cm : C.U.-seq. of brown silty sand at the top and brown silty clay in the lower part

113-133cm : Light grey silty clay-sand intercalations and Fe-oxide at the contact with the overlaying horizon

133-145cm : Dark grey to grey green clay with organic debris (wood, branch fragments and roots)

145-176cm : Pebble layer

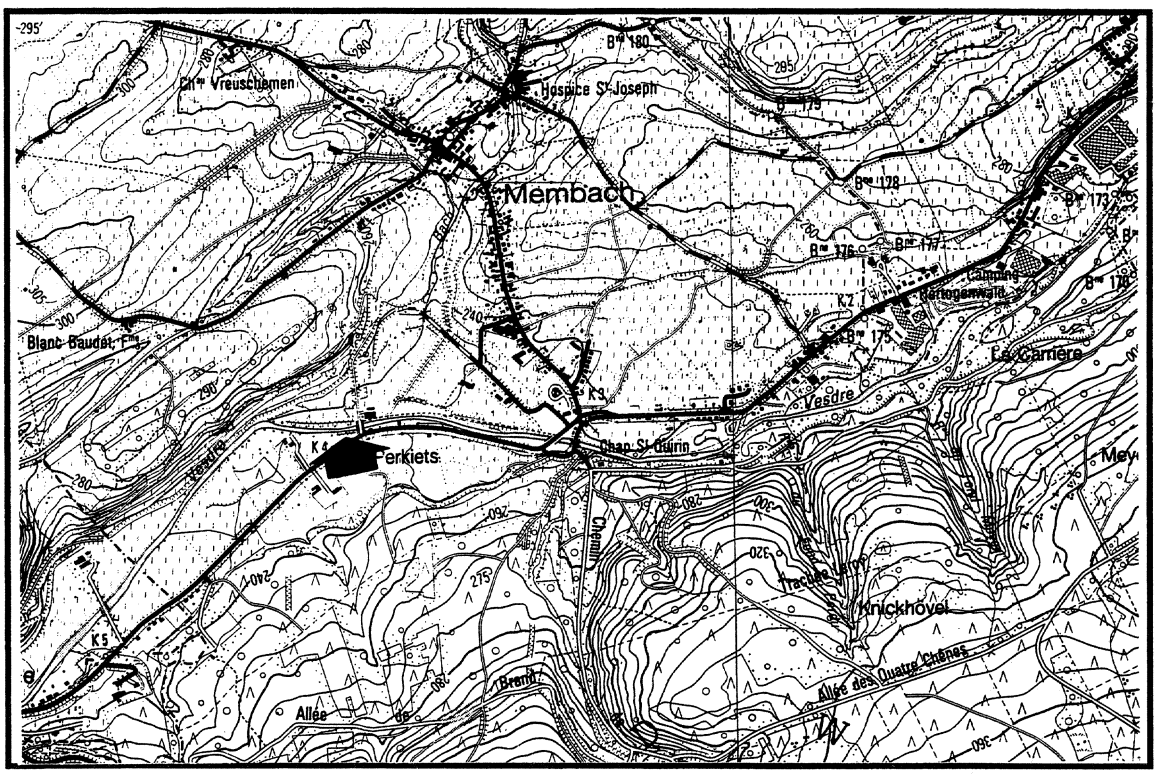
U-sample: 13-33 cm

L-sample: 133-145 cm

Vesdre **Profile 11006**

Sampling location

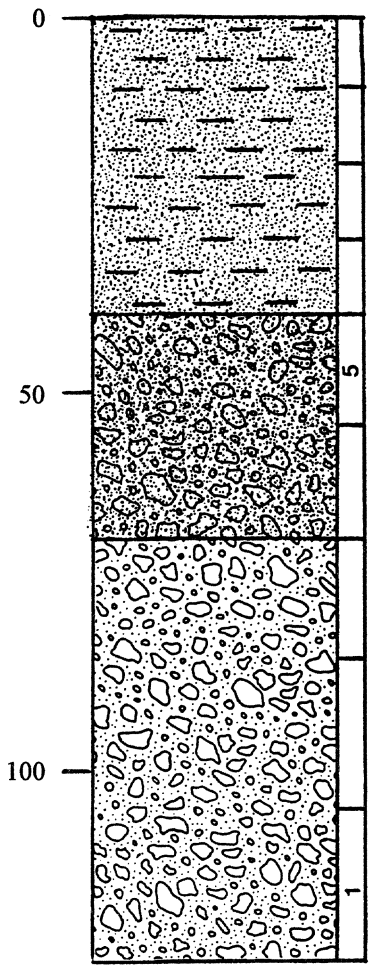
This sampling-site is located approximately 1 km south-south-west of the church of Membach, which is situated at some 10 km east-north-east from Verviers, in the north-eastern part of the province of Liège.



Coordinates:	50° 36' 49''	N	Map scale:	(1:25000)
	05° 59' 26''	E	Map number:	43/5-6
Altitude:	230	m	Date:	02/08/1991

Vesdre **Profile 11006**

Profile description



0-40cm : Homogeneous dark brown silty sand, heavily rooted

40-70cm : Dark brown silty sand with rock fragments (up to ϕ 50cm)

70-126cm : Pebble layer (limestone, quartz and slag fragments) with brown sandy matrix

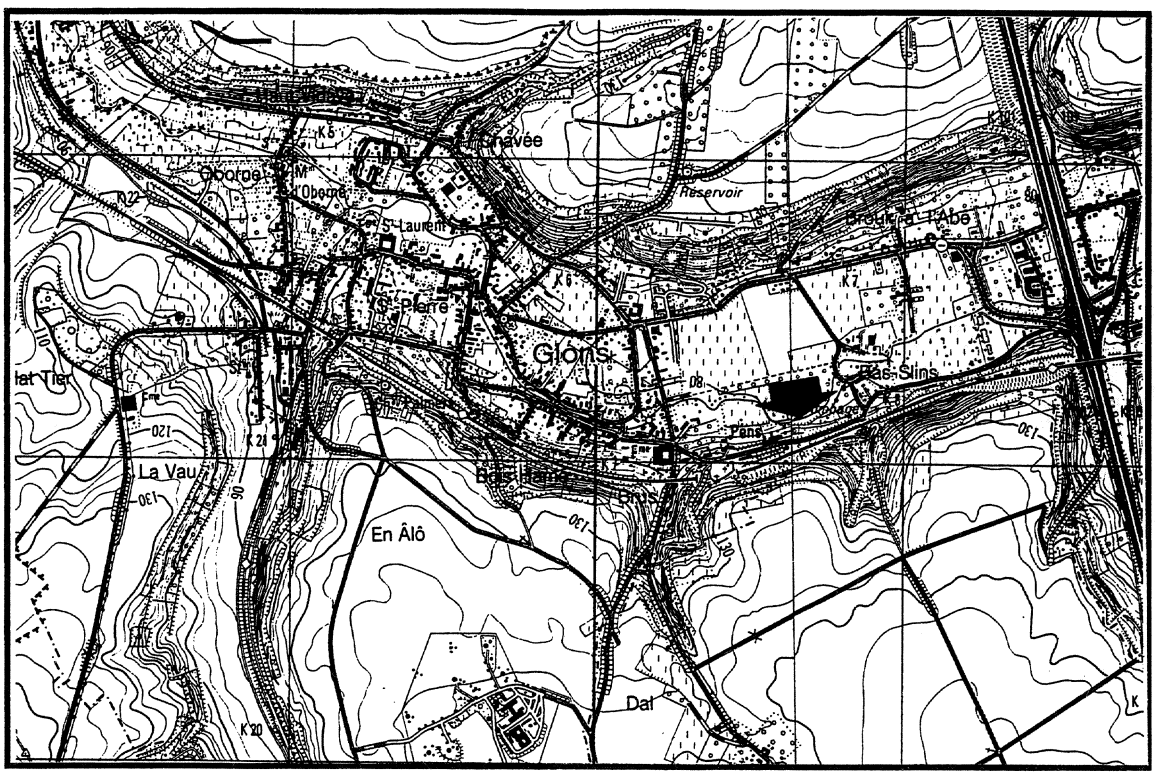
U-sample: 10-30 cm

L-sample: none

Geer **Profile 11007**

Sampling location

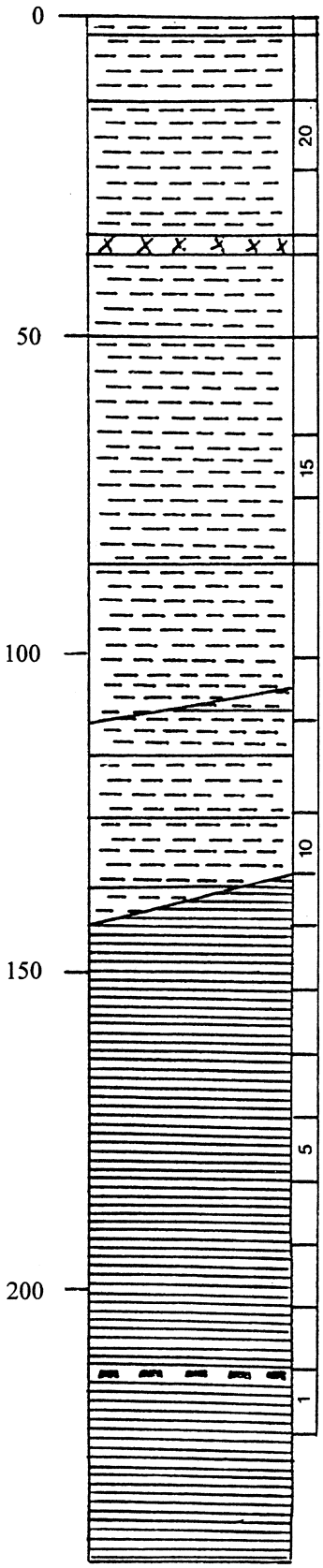
This sampling-site is located approximately 1 km east-south-east of the church of Glons, which is situated at some 15 km north-north-west from Liège.



Coordinates:	50° 44' 56''	N	Map scale:	(1:25000)
	05° 33' 42''	E	Map number:	34/5-6
Altitude:	80	m	Date:	13/08/1991

Geer **Profile 11007**

Profile description



0-3cm : Black brown organic rich silt

3-13cm : Light brown silt with brick fragments

13-50cm : Dark brown silt with in the middle part Fe-oxide rich layer

50-86cm : Homogeneous light brown silt with coal fragments

86-106cm : Brown silt with Fe-oxide precipitates

106-137cm : Brown clayey silt with coal fragments and Fe-oxide precipitates

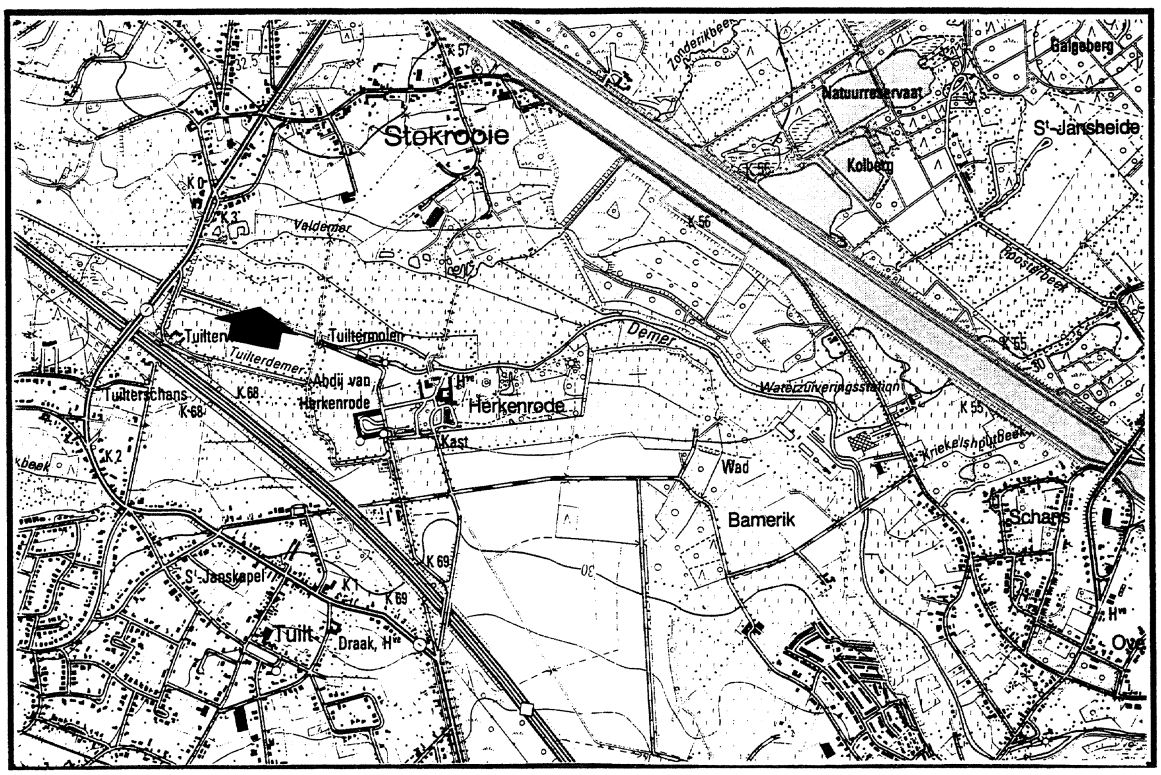
137-195cm : Homogeneous grey clay with dispersed some coal fragments. In lower part some wood and branch fragments

U-sample:	3-13	cm
L-sample:	137-187	cm

Demer **Profile 11008**

Sampling location

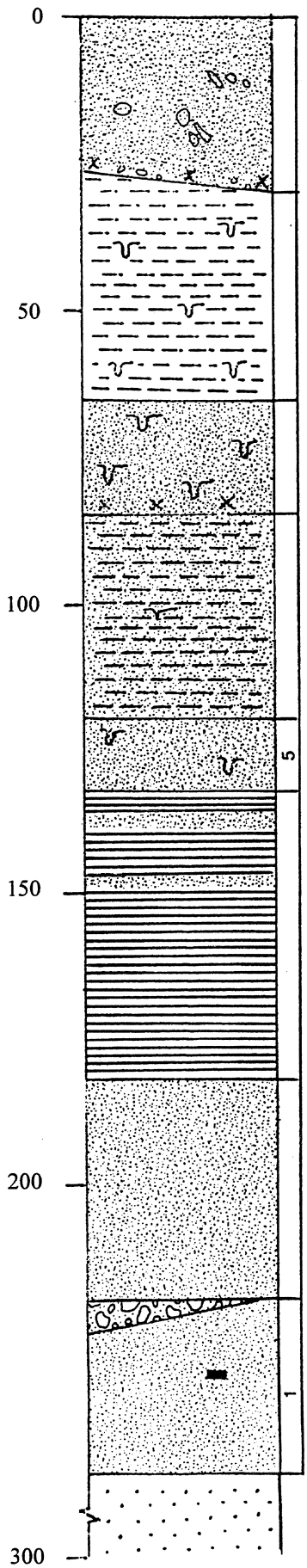
This sampling-site is situated approximately 750 m north-west of the castle of Herkenrode, which is located at some 4 km north-west from Hasselt, in the province of Limburg.



Coordinates:	50° 57' 40''	N	Map scale:	(1:25000)
	05° 15' 26''	E	Map number:	25/7-8
Altitude:	22	m	Date:	14/10/1991

Demer

Profile 11008



Profile description

0-30cm : Medium grained sand, heavily rooted. Different pebbles (mainly quartz) present, especially at the base (well-rounded, sometimes broken). Locally some bleached spots. Fe-oxide near the base

30-66cm : Dark brown silt, heavily bioturbated with red brown spots. Locally black clays. Irregular distribution of organic material. Large roots present

66-85cm : Heavily bioturbated white grey to beige medium to fine sand, mottled due to Fe-impregnation's. Fe-oxide rich layer in lower part

85-121cm : F.U.-seq. within blue green sandy silt, mottled due to Fe-oxide spots. Small brick fragments. Lower part consists of blue grey to light grey more sandy silt with Fe-spots

121-133cm : Medium sand, white to yellow brown, Fe-oxide in the lower part

133-183cm : Mainly brown clay with few sandy intercalations. In the latter some charcoal fragments occur. Locally some bioturbations which are all filled by fine sand

183-220cm : Medium grained sand, irregularly layered. Irregular grey brown to whitish horizons occur. Locally some clay bands. In lower part green coloured

220-225cm : Pebble layer with broken chert and quartz pebbles

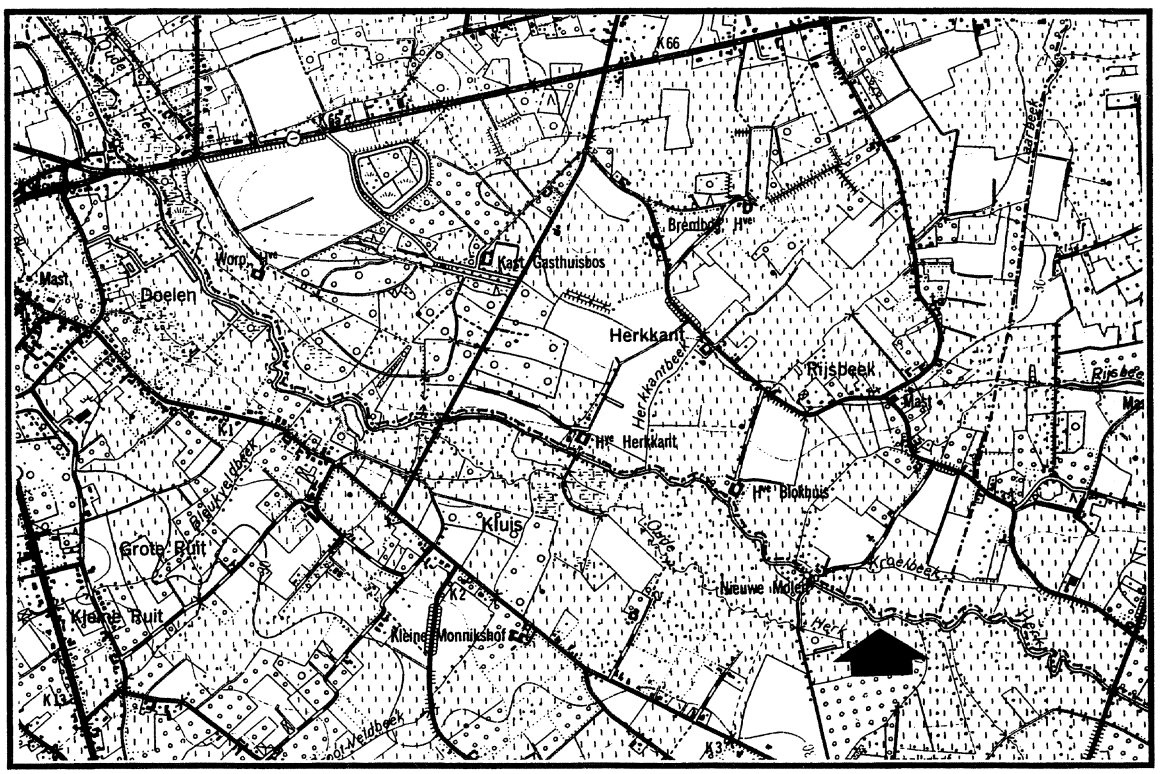
225-250cm : Green grey sand with coarse particles. Locally some pebbles occur. Organic matter occurs in lenses

U-sample:	30-66	cm
L-sample:	183-220	cm

Herk **Profile 11009**

Sampling location

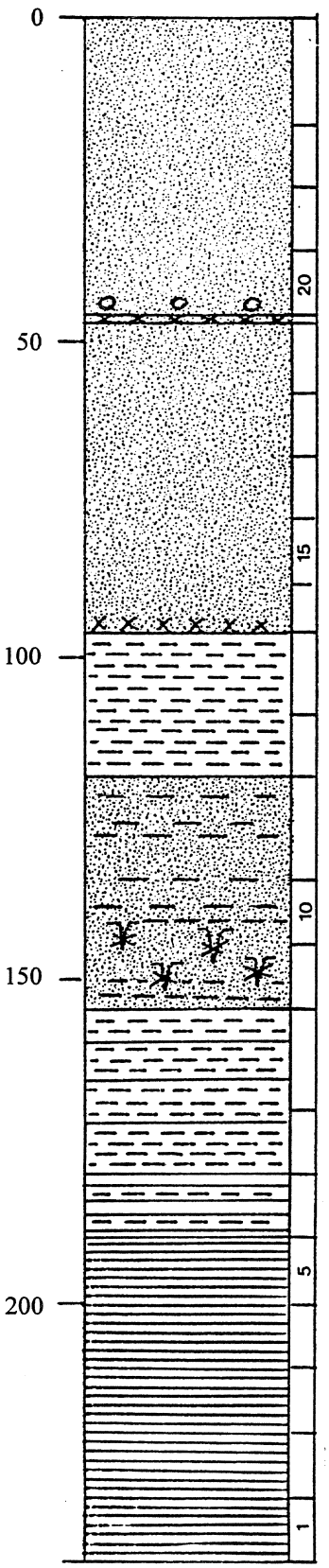
This sampling-site is located approximately 250 m south-east of 'De Nieuwe Molen', 4.5 km south-east from Herk-De-Stad, which is situated some 13 km west of Hasselt, in the province of Limburg.



Coordinates:	50° 55' 48''	N	Map scale:	(1:25000)
	05° 12' 32''	E	Map number:	25/5-6
Altitude:	22	m	Date:	15/07/1991

Herk **Profile 11009**

Profile description



0-46cm : Medium grained sand with dispersed Fe-oxide spots. In lower part occurrence of an horizon enriched in Fe-oxides and brick fragments

46-96cm : Brown fine grained sand with whitish coloured bioturbation features. In lower part presence of a Fe-oxide enriched horizon

96-120cm : Bioturbated brown silt with Fe-oxide spots

120-156cm : Grey green silt to fine grained sand with vague bioturbation features. In lower part some cracks which are filled with Fe-oxides

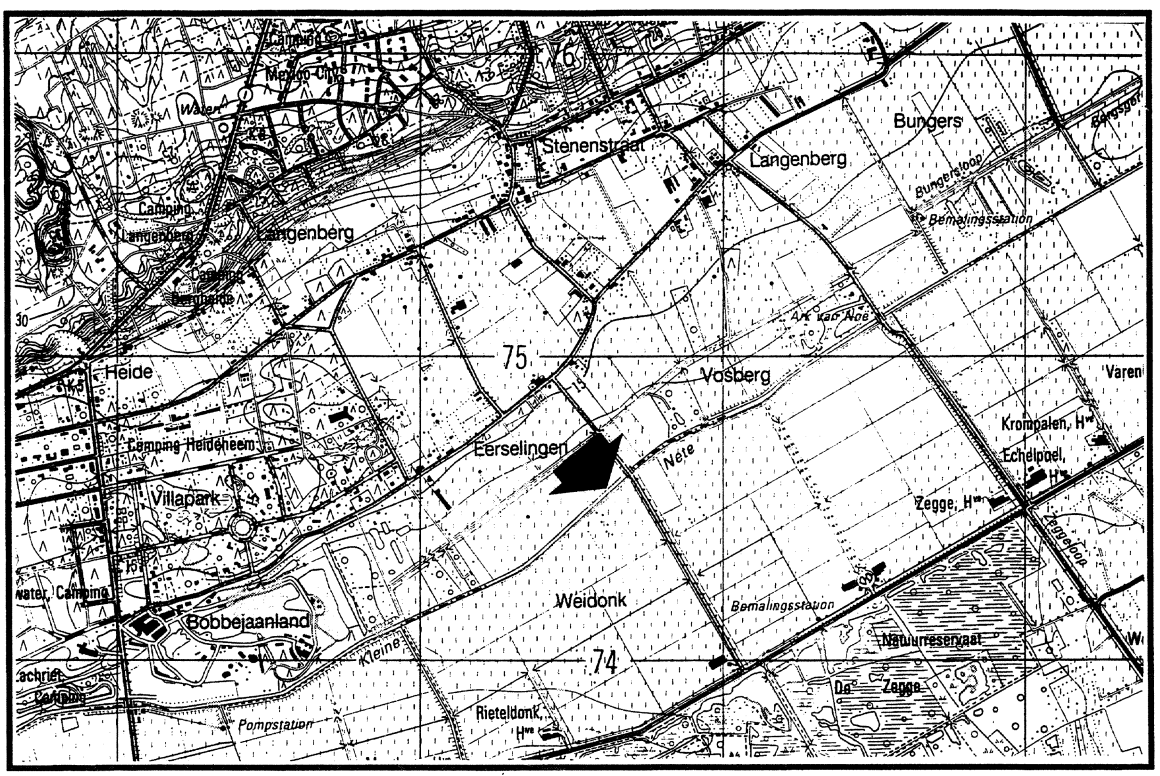
156-243cm : C.U. seq. of dark grey to grey green glauconite bearing clay which grades into silt. Within the upper layers some mica-rich accumulations occur parallel to the stratification

U-sample: 0-46 cm

L-sample: 120-155 cm

Sampling location

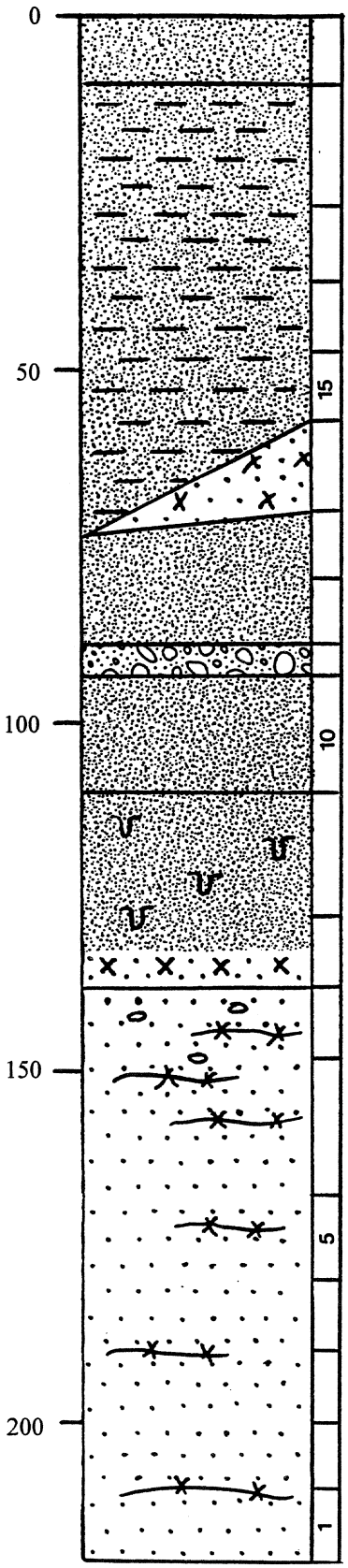
This sampling-site is located approximately 1.1 km south-south-west of the chapel of Langenberg, 2.5 km south of Lichtaart, which is situated some 10 km north-east of Herentals, in the eastern part of the province of Antwerpen.



Coordinates:	51° 12' 18''	N	Map scale:	(1:25000)
	04° 55' 38''	E	Map number:	16/3-4
Altitude:	7	m	Date:	29/07/1991

Kleine Nete **Profile 11010**

Profile description



0-10cm : Beige fine grained sand with Fe-oxide rich levels

10-65cm : Homogeneous brown silty sand with dispersed rock and slag fragments

65-70cm : Brown reddish coarse grained sand, layered aspect due to presence of Fe-oxide concretions (ϕ 1 cm)

70-89cm : Light orange Fe-oxide rich medium grained sand. Limonite crust occur. Vaguely layered. Quartz pebbles occur

89-94cm : Lensoidic pebble bed with very fine flint pebbles

94-111cm : Orange Fe-rich medium grained sand

111-142cm : White fine sand with bioturbations. Within the latter green coarse grained sand

142-222cm : Grey green coarse grained glauconite rich sand with fine Fe-oxide rich laminae and brown sand lenses. Slag and brick fragments locally dispersed

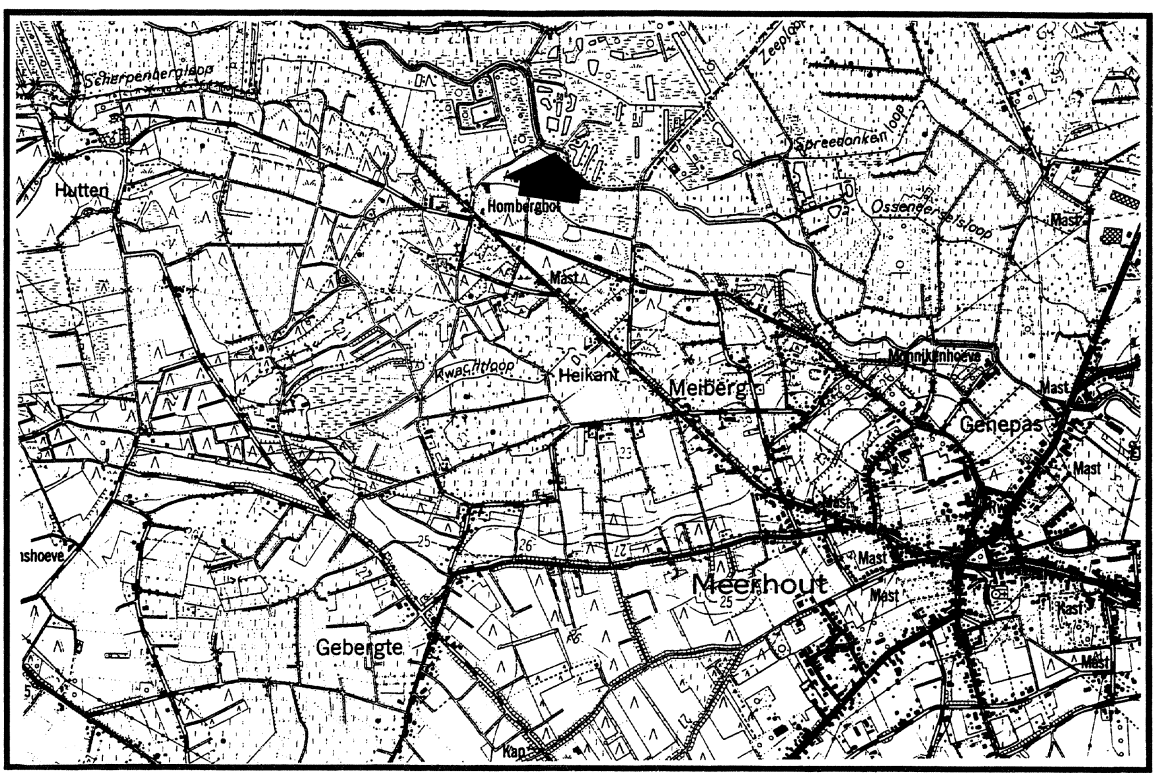
>222 cm : Finely laminated glauconite-rich sand (possibly reworked Diestian sands)

U-sample: 14-43 cm

L-sample: 142-167 cm

Sampling location

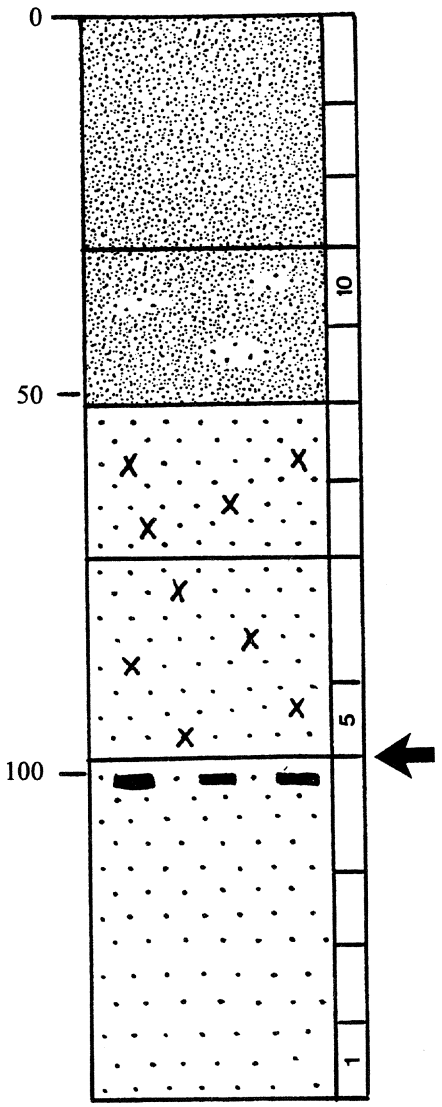
This sampling-site is located approximately 2 km north-west of the church of Meerhout, which is situated some 10 km south-east of Geel, in the eastern part of the province of Antwerpen.



Coordinates:	51° 08' 41''	N	Map scale:	(1:25000)
	05° 03' 33''	E	Map number:	17/5-6
Altitude:	11	m	Date:	14/08/1991

Grote Nete **Profile 11011**

Profile description



0-32cm : Brown fine grained sand

32-52cm : Brown medium grained sand with coarse green sand lenses

52-72cm : Grey coarse grained sand with Fe-oxides

72-98cm : Green coarse grained sand with Fe-oxides

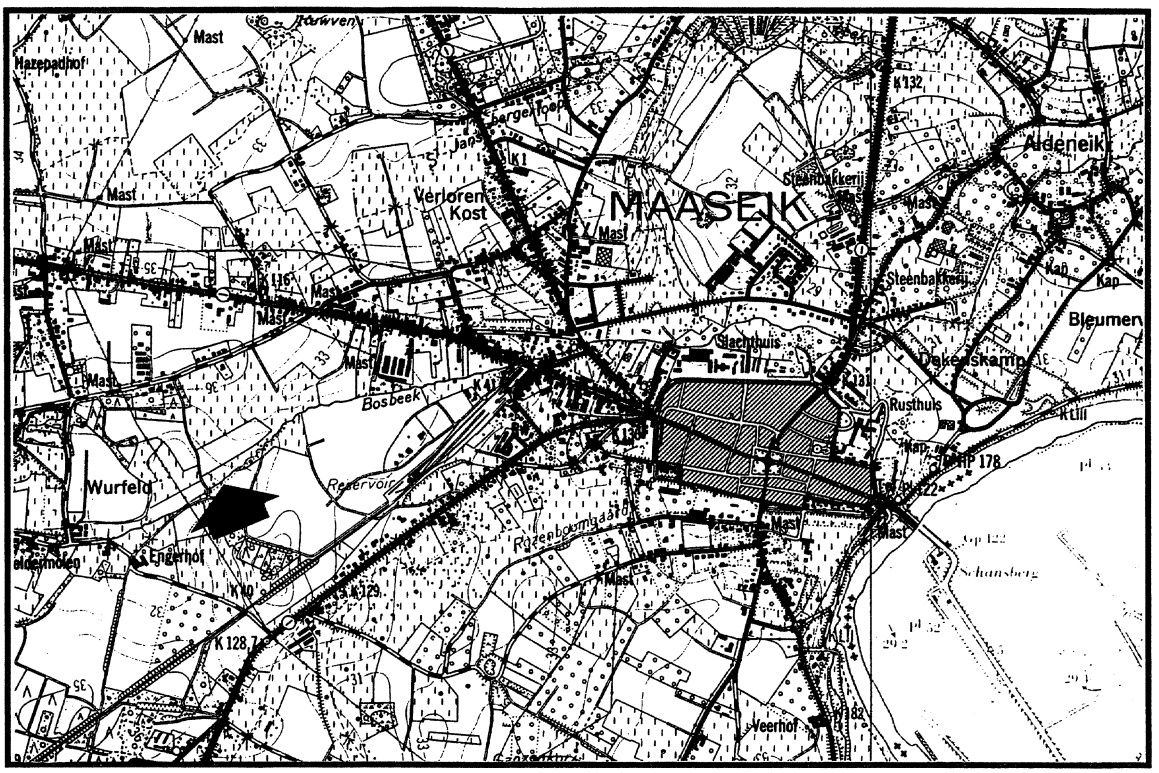
98-146cm : Green coarse grained sand enriched in organic matter, causing a laminated aspect

U-sample: 31-52 cm

L-sample: 115-145 cm

Sampling location

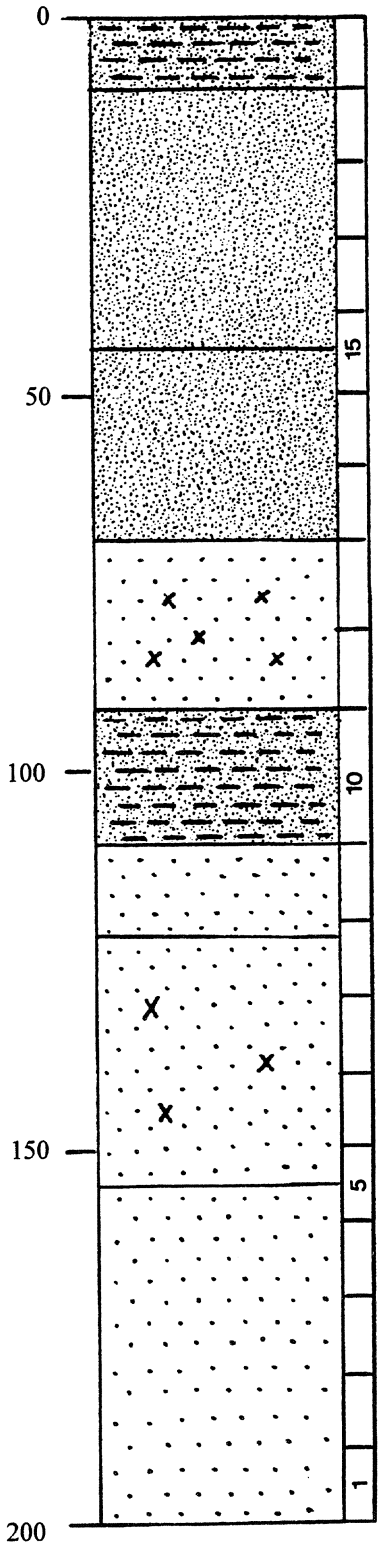
This sampling-site is situated approximately 400 m north-east of the 'Engerhof' farm in Wurfeld, a hamlet located some 2.5 km south-west of Maaseik, in the north-eastern part of the province of Limburg.



Coordinates:	51° 05' 37''	N	Map scale:	(1:25000)
	05° 46' 02''	E	Map number:	18/7-8
Altitude:	33	m	Date:	12/08/1991

Bosbeek **Profile 11012**

Profile description



0-10cm : Organic-rich black brown sandy silt

10-44cm : Homogeneous fine beige sand

44-70cm : Brown medium grained sand

70-93cm : Grey coarse grained sand with Fe-oxides

93-111cm : Black brown sandy silt

111-123cm : Brown coarse grained sand

123-156cm : Brown grey coarse grained sand with dispersed Fe-oxide spots and coal fragments

156-200cm : Grey green coarse grained sand

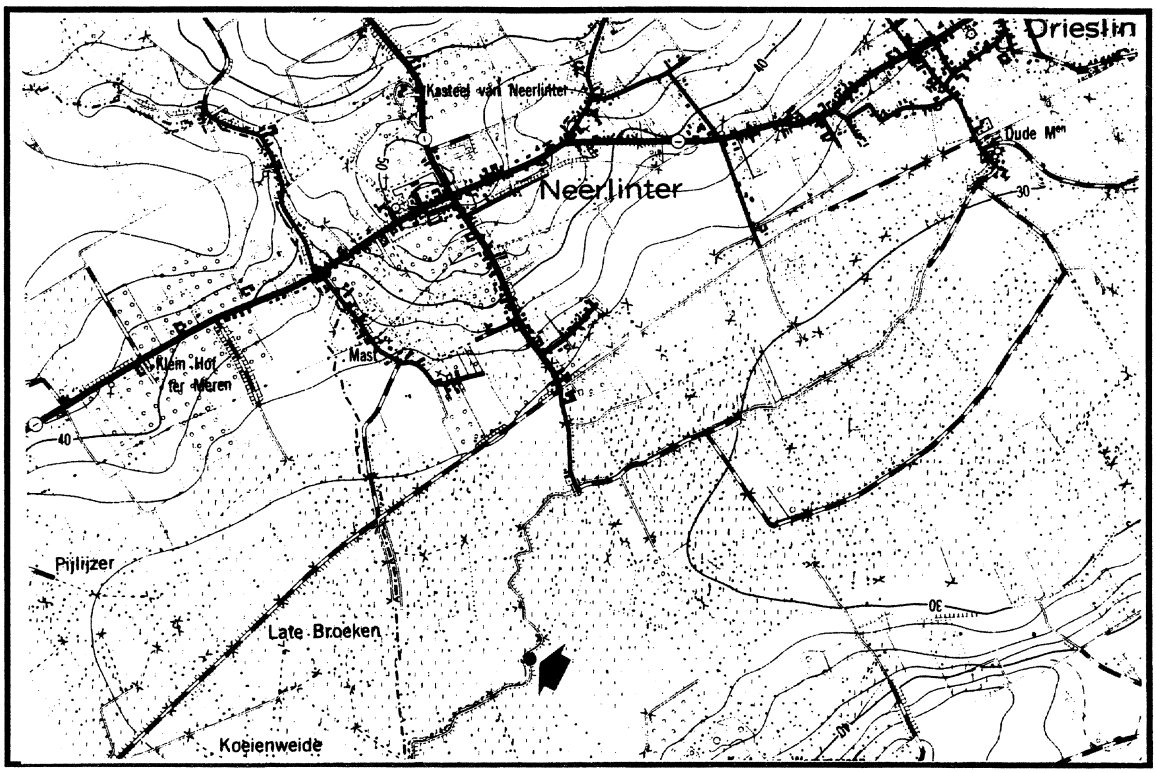
U-sample: 3-44 cm

L-sample: 156-200 cm

Grote Gete **Profile 11015**

Sampling location

This profile is located about 1.5 km due south of the village of Neerlinter in the eastern part of the province of Vlaams-Brabant. Along the river-banks occur well-developed natural levees. A clear coarsening upward sequence is present from a depth of 200cm up to the top. The profile is strongly rooted up to 115cm depth.

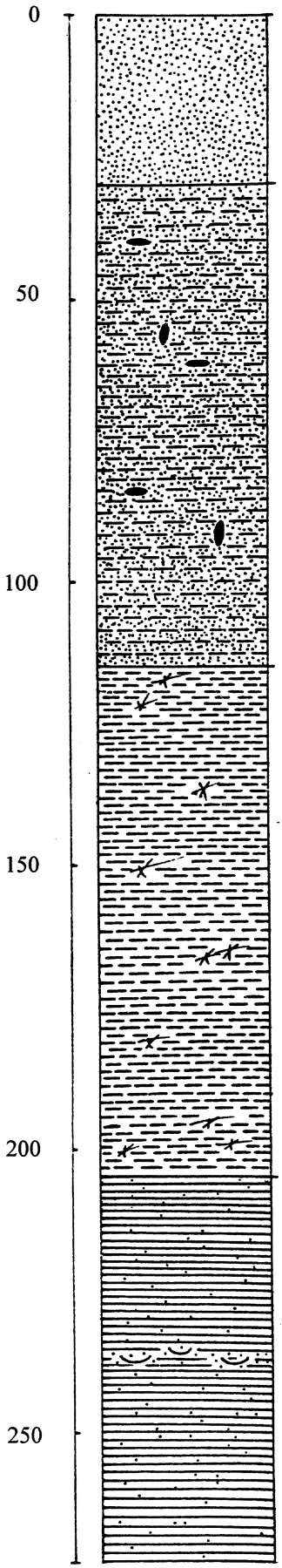


Coordinates:	51° 49' 37''	N	Map scale:	(1:25000)
	05° 01' 34''	E	Map number:	33/1-2
Altitude:	31	m	Date:	29/07/1992

Grote Gete

Profile 11015

Profile description



0-30cm : Humus rich and strongly rooted, brown coloured, sandy horizon

30-115cm : Homogeneous, yellow to beige coloured, silty sand which contains brick and charcoal fragments

115-205cm : Whitish beige to beige silt with faint lamination and in the lower & middle part iron oxide spots

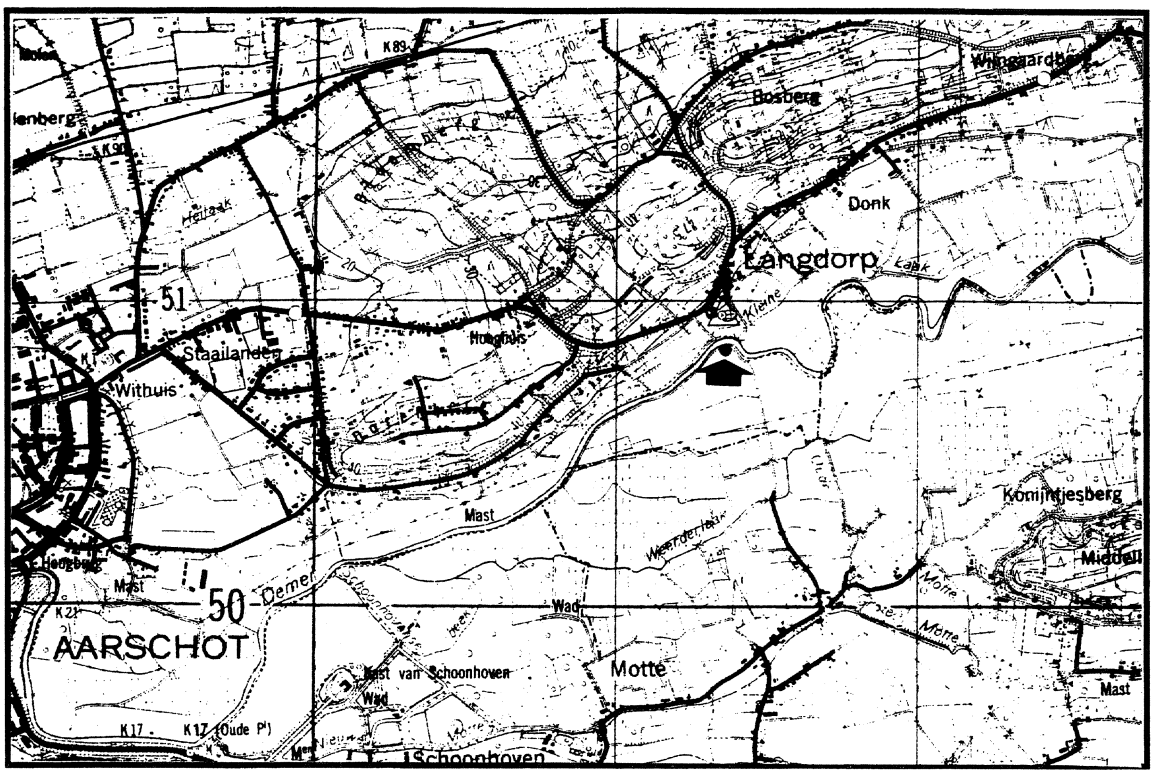
205-276cm : Homogeneous, green to grey coloured clay with a sandy intercalation containing shells

U-sample: 40-70 cm

L-sample: 210-270 cm

Sampling location

This sampling-site is located 2.5 km east of the town of Aarschot in the direct vicinity of the village of Langdorp (approximately 100m due south of the church). Langdorp is situated in the north-eastern part of Vlaams-Brabant. The rooting-zone is nearly 1m deep.

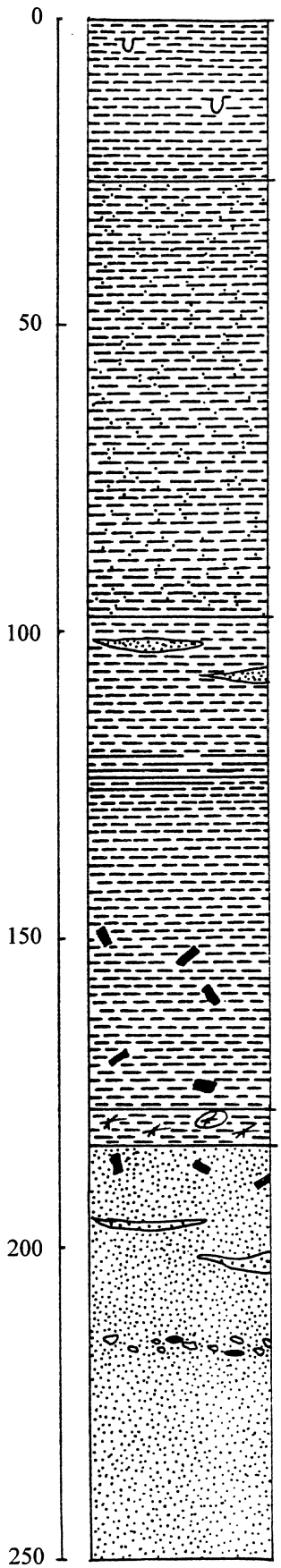


Coordinates:	50° 59' 37''	N	Map scale:	(1:25000)
	04° 52' 17''	E	Map number:	24/7-8
Altitude:	20	m	Date:	18/08/1992

Demer

Profile 11016

Profile description



0-26cm : Humus rich, dark brown silt with bioturbation cavities filled by fine grained, white sand

26-97cm : Homogeneous, brown coloured, sandy silt

97-177cm : Brown to grey coloured, mottled silt with lenses of coarse, rusty coloured sand and a rusty coloured, silty clay horizon (between 120-125cm), in the deepest section (between 147-177cm) several wood fragments occur

177-183cm : Rusty coloured silt with iron oxide nodules

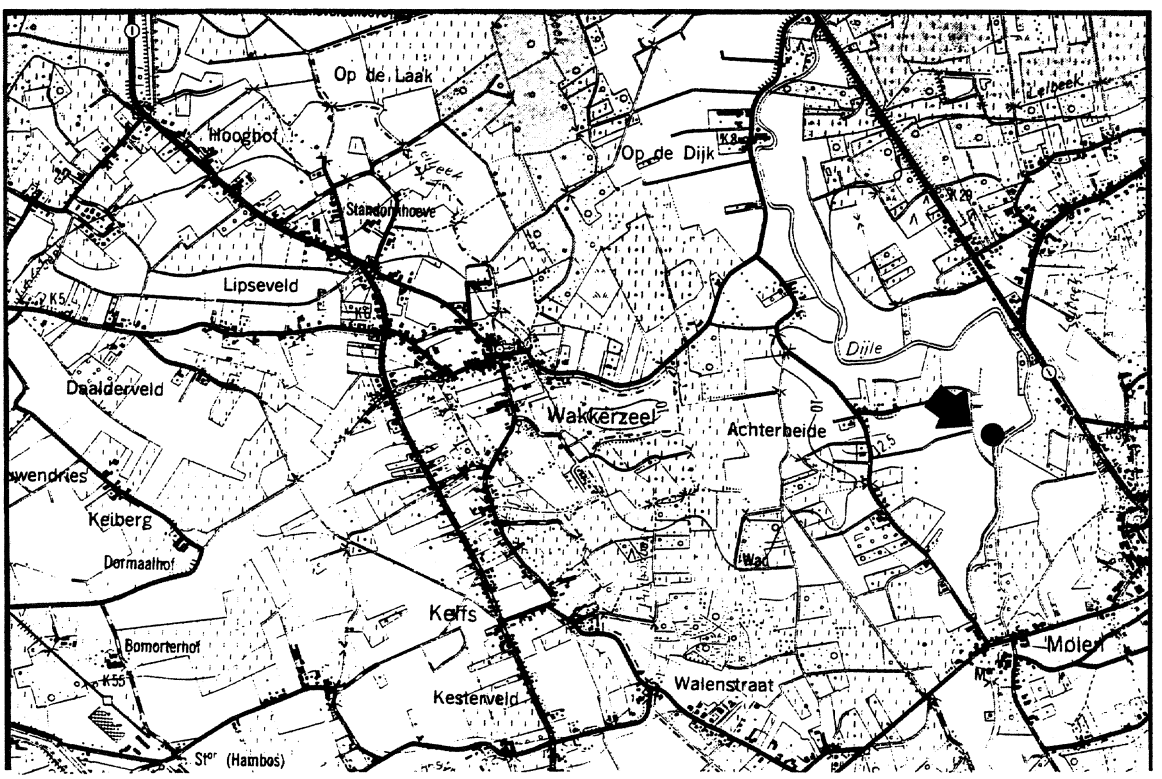
183-250cm : Coarse grained, greyish green sand containing wood at the top and lenses of coarse grained, rusty coloured sand and with a thin, brick containing gravel bed (between 213-217cm)

U-sample: 40-70 cm

L-sample: 200-246 cm

Sampling location

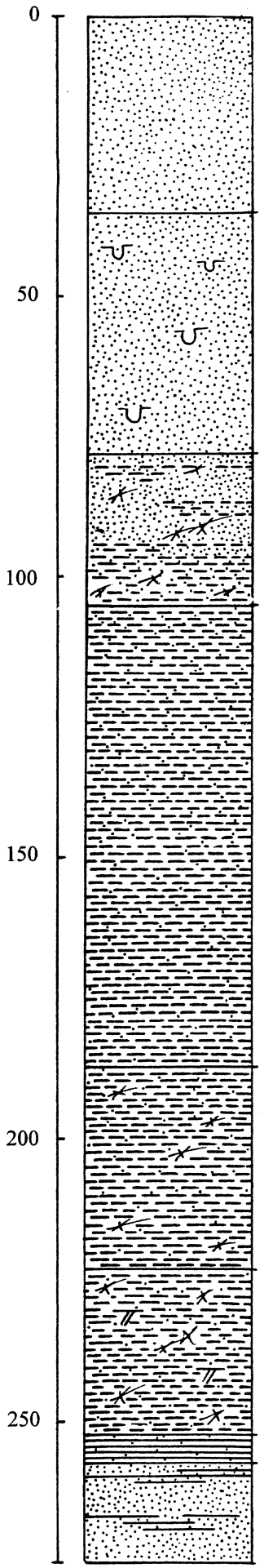
The sampling-site is situated on the banks of the Dijle, approximately 500m to the north-west from the church of Rotselaar in the northern part of the province Vlaams-Brabant. The rooting-zone is rather shallow and is just 20cm deep.



Coordinates:	50° 57' 44''	N	Map scale:	(1:25000)
	04° 42' 16''	E	Map number:	24/5-6
Altitude:	11	m	Date:	30/07/1992

Dijle

Profile 11017



Profile description

0-35cm : Humus rich, brown coloured sand

35-78cm : Homogeneous, yellow brown coloured sand with bioturbation cavities filled by coarse grained sand

78-105cm : Finely laminated, grey, silty sand and rusty coloured sandy silt

105-187cm : White to beige coloured, mottled, sandy silt

187-223cm : Whitish beige, sandy silt with iron oxide spots

223-252cm : Brown to yellowish brown, sandy silt with oblique lamination and iron oxide spots

U-sample: 37-68 cm

L-sample: 250-280 cm

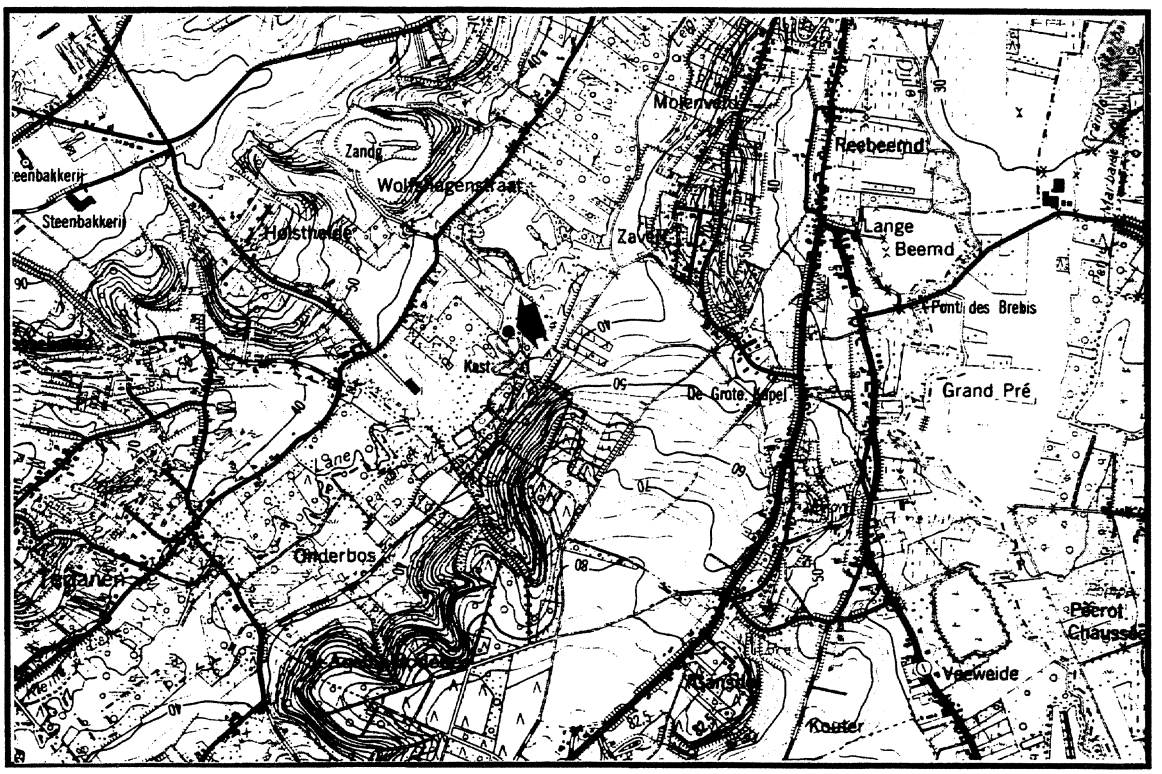
252-257cm : Grey, sandy clay

257-299cm : Grey, clay rich sand

Laan **Profile 11018**

Sampling location

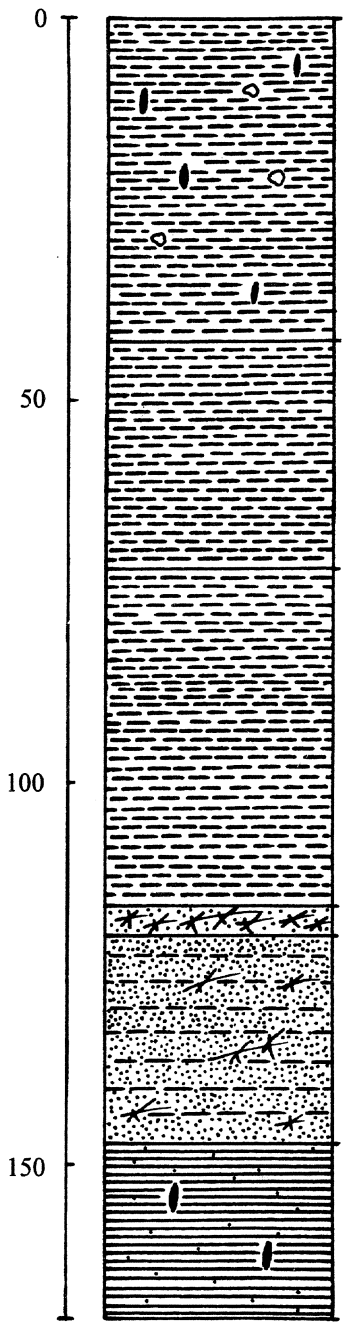
This profile is located approximately 1.25km north-east of the hamlet of Terlanen, 5km due east of the village of Overijse in Vlaams-Brabant. The rooting-zone is just 10cm deep.



Coordinates:	50° 46' 35''	N	Map scale:	(1:25000)
	04° 37' 08''	E	Map number:	32/5-6
Altitude:	35	m	Date:	19/07/1992

Laan **Profile 11018**

Profile description



0-42cm : Dark brown silt (uppermost 10cm is rooted) with fragments of sandstone and coal

42-72cm : Greyish brown, mottled silt

72-116cm : Grey, mottled, sandy silt with dark brown spots

116-120cm : Rusty coloured, sandstone horizon (grains cemented by iron oxide)

120-147cm : Grey, silty sand with numerous iron-oxide spots

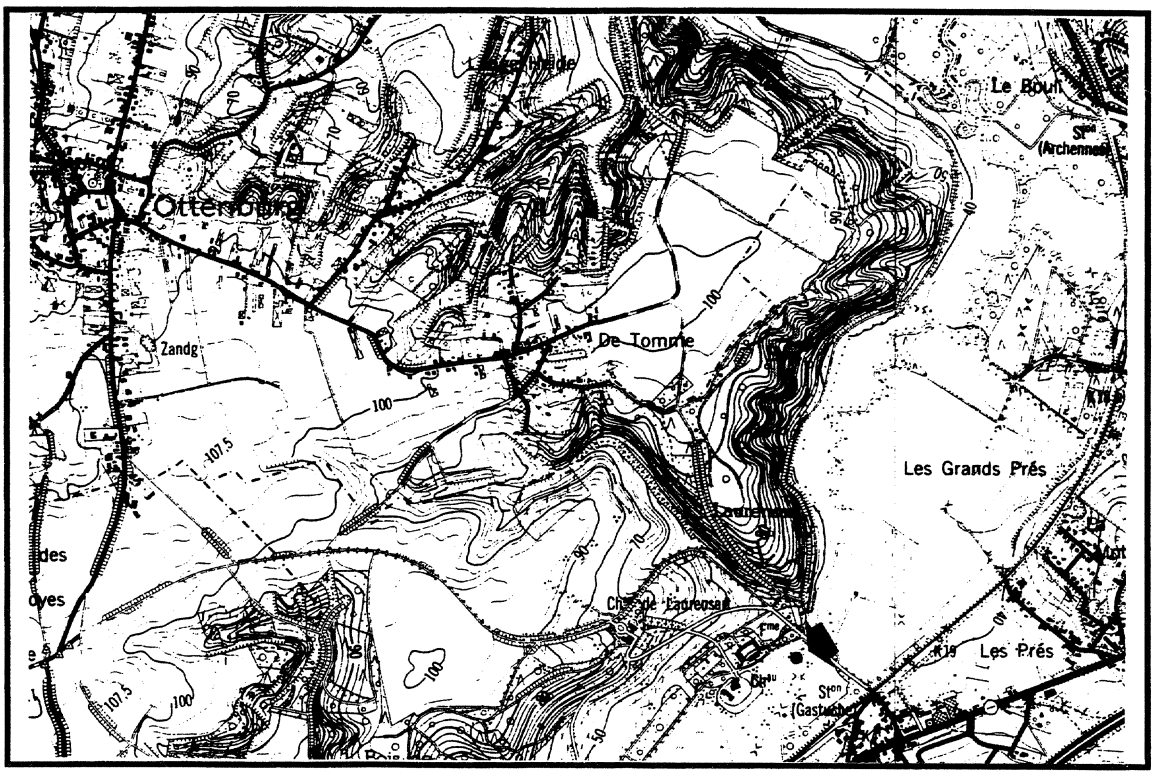
147-170cm : Homogeneous, greyish green sandy clay with charcoal fragments

U-sample: 20-42 cm

L-sample: 150-170 cm

Sampling location

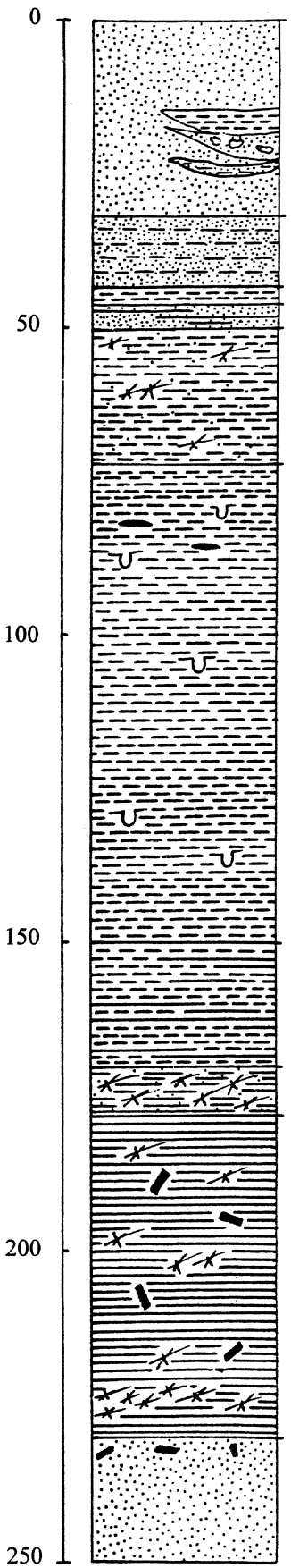
The 11019-profile is located near the railway-station of the hamlet of Gastuche, approximately 3.5km north-east of the town of Wavre in the province of Brabant Wallon. The rooting-zone in this profile is about 20cm deep.



Coordinates:	50° 44' 21''	N	Map scale:	(1:25000)
	04° 39' 04''	E	Map number:	32/5-6
Altitude:	40	m	Date:	19/07/1992

Dyle

Profile 11019



Profile description

0-32cm : Medium grained, whitish grey coloured sand, with lenses consisting out of divers materials. There are lenses of yellowish brown silt, or of coarse grained, brown coloured sand with dispersed gravel and of dark brown, silty sand

32-44cm : Dark brown, silty sand

44-47cm : Yellowish brown silt

47-50cm : Grey clay and rusty coloured sand

50-72cm : Dark brown, sandy silt with thin crusts of iron oxide

72-150cm : Homogeneous, brown silt with brick fragments and bioturbation

150-170cm : Light brown coloured, finely laminated, clay rich silt

170-178cm : Grey, sandy clay rich in iron oxide

178-230cm : Grey clay with iron oxide spots and wood fragments

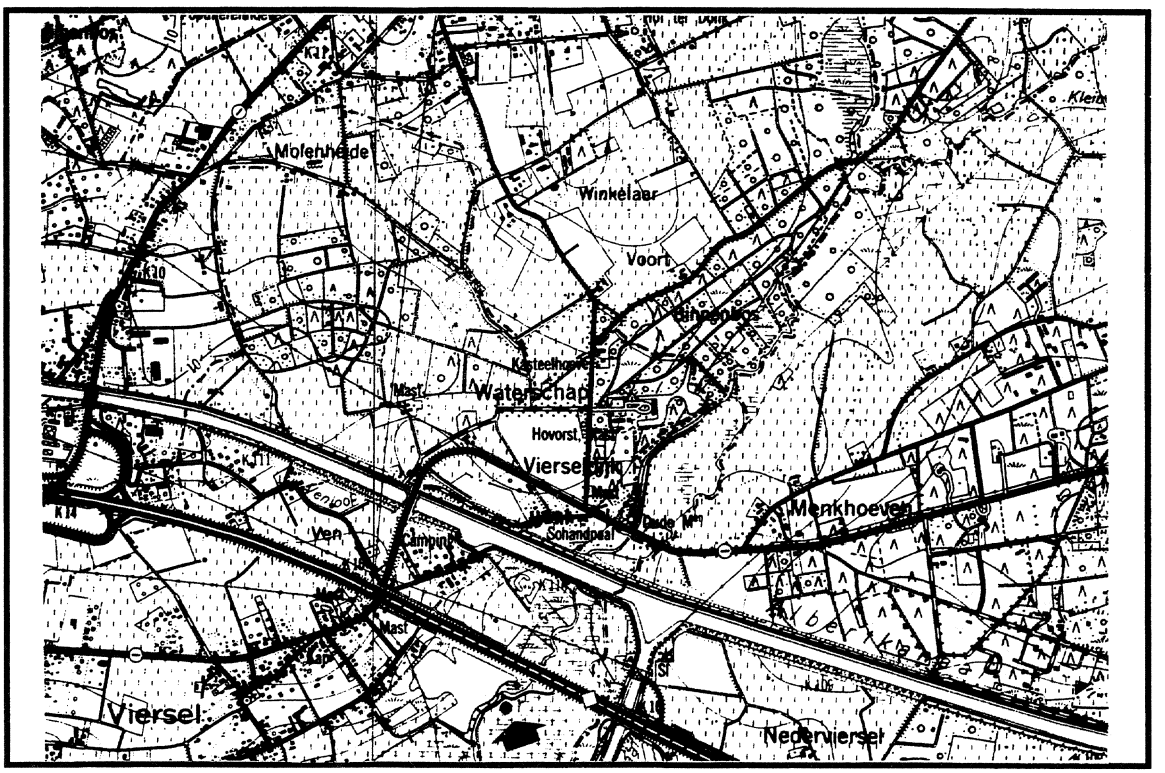
230-250cm : Coarse grained, whitish grey sand with a horizon of organic material at 235cm depth

U-sample:	40-63	cm
L-sample:	230-250	cm

Molenbeek **Profile 11021**

Sampling location

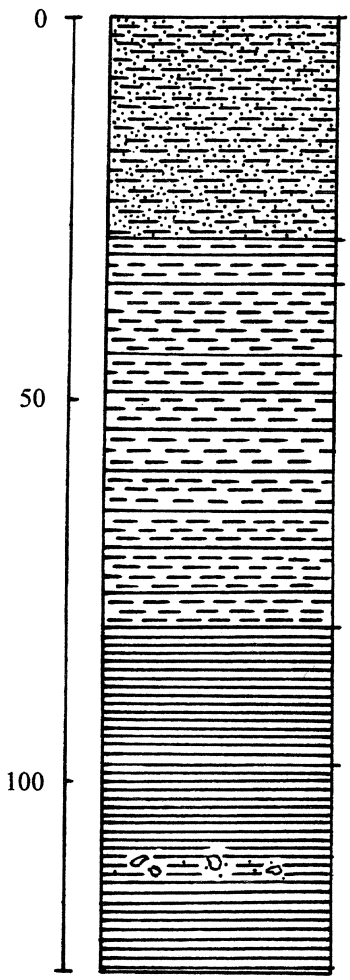
The Molenbeek sampling site is situated in the province of Antwerpen, 0.9km due west of the village of Viersel and approximately 3.25km due south of the village of Zandhoven. The rooting-zone is 30cm deep.



Coordinates:	51° 11' 21''	N	Map scale:	(1:25000)
	04° 39' 40''	E	Map number:	16/1-2
Altitude:	5	m	Date:	15/09/1992

Molenbeek **Profile 11021**

Profile description



0-29cm : Brown, sandy silt (rooted zone)

29-35cm : Light brown coloured, clay rich silt

35-44cm : Whitish beige silt

44-80cm : Homogeneous, brown coloured clay rich silt

80-98cm : Bright orange brown clay

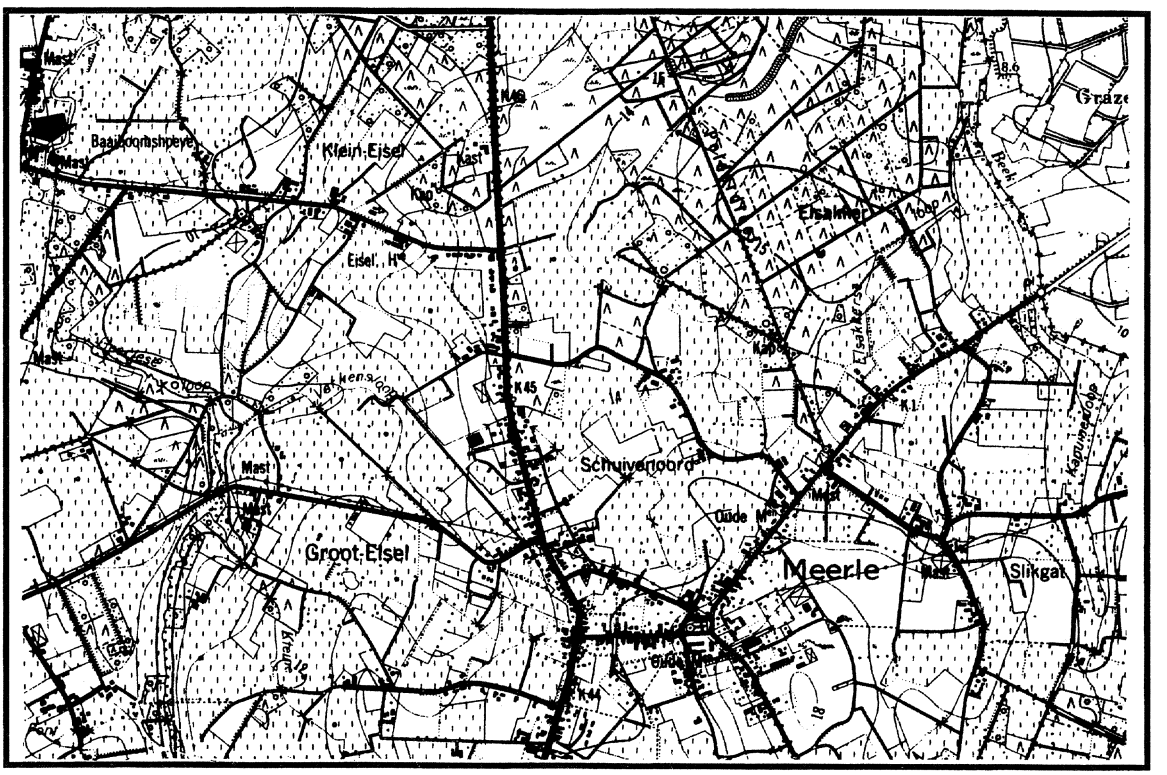
98-125cm : Humus rich, black clay, between 112-115cm depth occurs a sandy zone which contains some small gravel

U-sample: 0-29 cm

L-sample: 100-125 cm

Sampling location

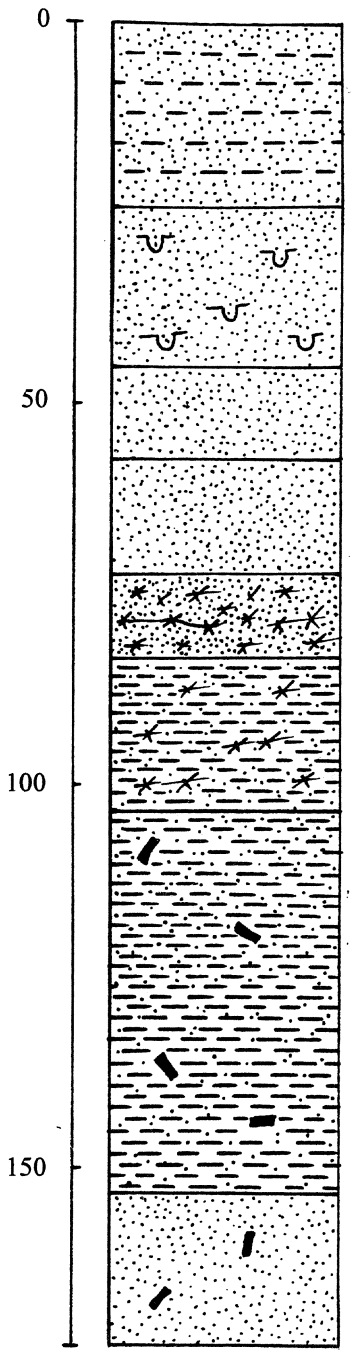
This profile is located in the province of Antwerpen, less than 2km from the Dutch border. The actual sampling site is 2.5km north-west of the village of Meerle, along the river Mark.



Coordinates:	51° 29' 17''	N	Map scale:	(1:25000)
	04° 46' 30''	E	Map number:	2/7-8
Altitude:	9	m	Date:	16/09/1992

Mark **Profile 11022**

Profile description



0-24cm : Black to brown coloured, silty sand

24-45cm : Brown, bioturbated sand. The bioturbations are filled with light brown sand

45-57cm : Light brown coloured sand

57-72cm : Greyish brown coloured, mottled sand

72-83cm : Orange brown coloured sand with iron oxide crusts

83-103cm : Dark grey, sandy silt with thin iron oxide crusts

103-153cm : Black, sandy silt with wood fragments

153-173cm : Light grey coloured sand with wood fragments

U-sample: 54-72 cm

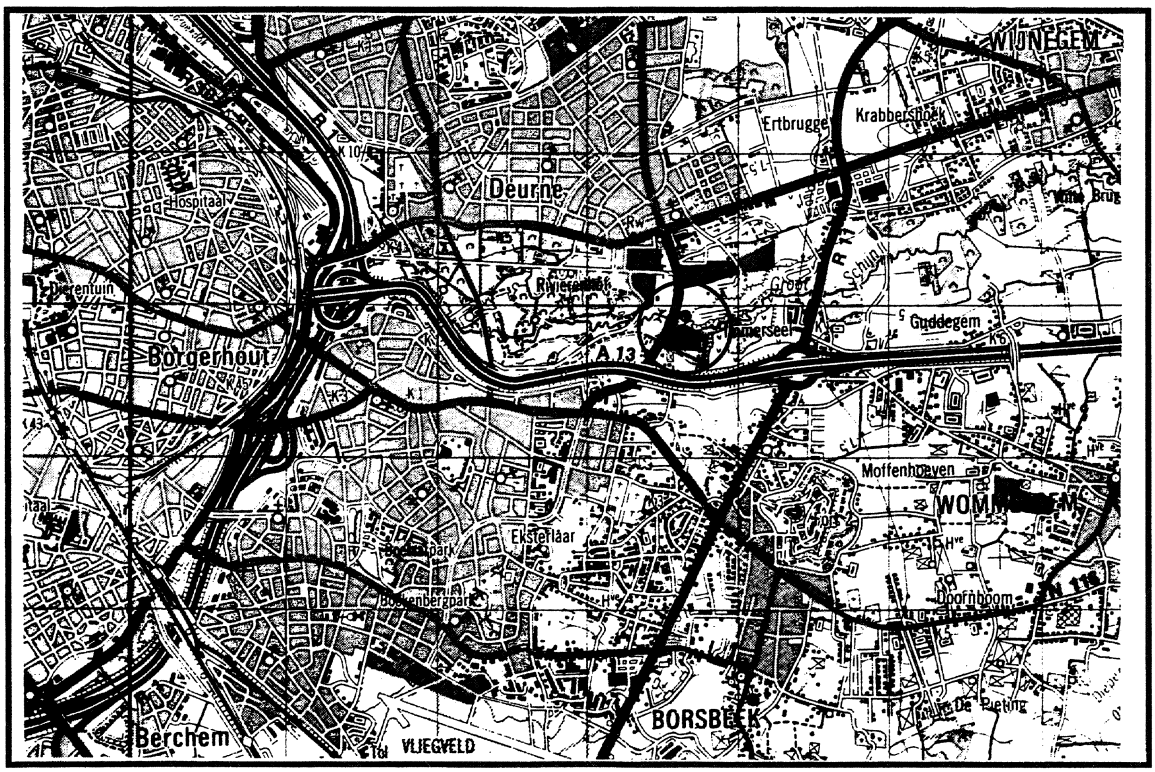
L-sample: 153-173 cm

Groot Schijn

Profile 11023

Sampling location

The 11023 site along the Groot Schijn is situated in the Antwerp suburb of Deurne, north of the A13-motorway, approximately 4.25km due east of Antwerp central station. In the top horizon of this profile porcelain fragments occur.

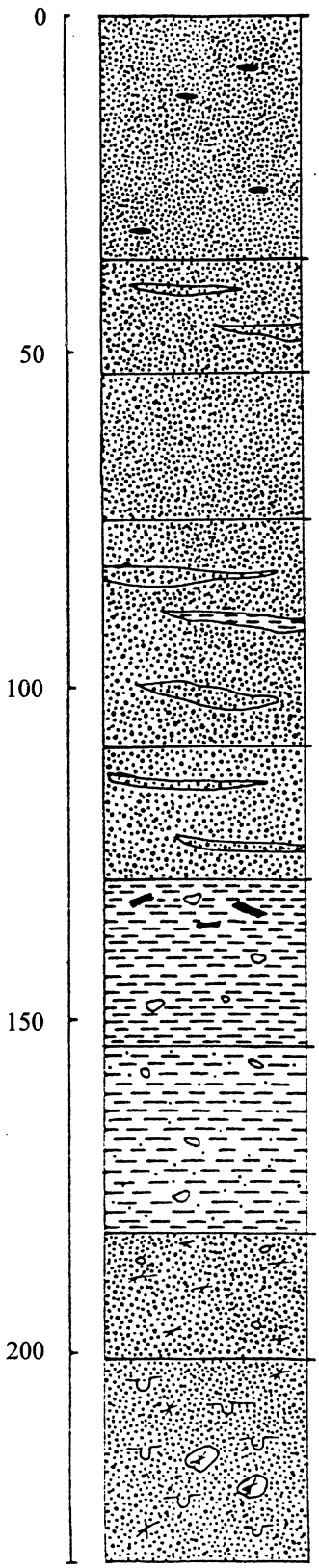


Coordinates:	51° 12' 53''	N	Map scale:	(1:50000)
	04° 29' 01''	E	Map number:	15
Altitude:	5	m	Date:	02/10/1992

Groot Schijn

Profile 11023

Profile description



0-36cm : Homogeneous, black to brown coloured sand with fragments of brick, glass and porcelain

36-53cm : Coarse grained, rusty coloured sand with lenses of coarse, grey sand

53-75cm : Coarse, whitish grey sand

75-109cm : Coarse, whitish grey sand with lenses of brown silt or coarse, rusty coloured sand

109-129cm : Coarse, greyish green sand with lenses of coarse, rusty coloured sand

129-154cm : Homogeneous, dark brown silt with white quartz pebbles and fragments of slate and wood (the latter at the top)

154-182cm : Homogeneous, reddish brown, sandy silt with white quartz pebbles, flattened silex fragments and small limestone fragments (the latter at the top)

182-201cm : Homogeneous, coarse grained, light green coloured sand with iron oxide spots and with (dispersed) quartz pebbles

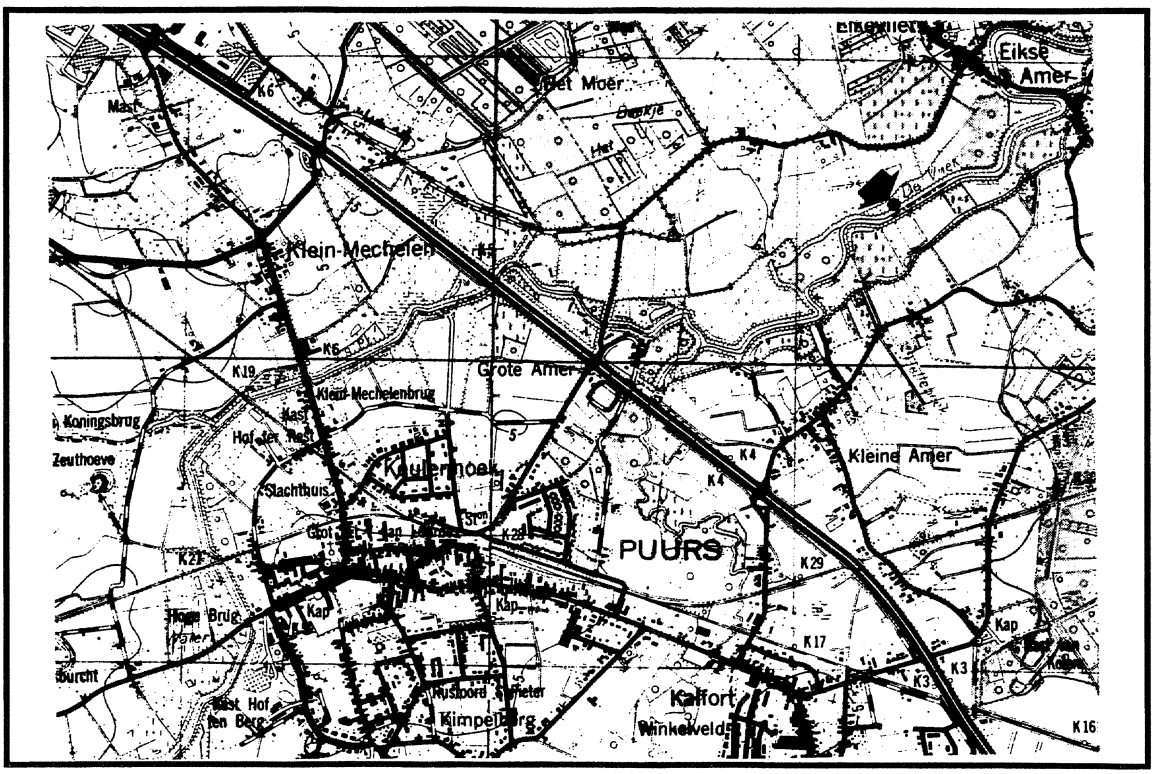
201-235cm : Coarse grained, dark grey sand forming Fe-oxide nodules. The sediment is strongly bioturbated. The bioturbation cavities are filled with white sand

U-sample: 53-75 cm

L-sample: 201-231 cm

Sampling location

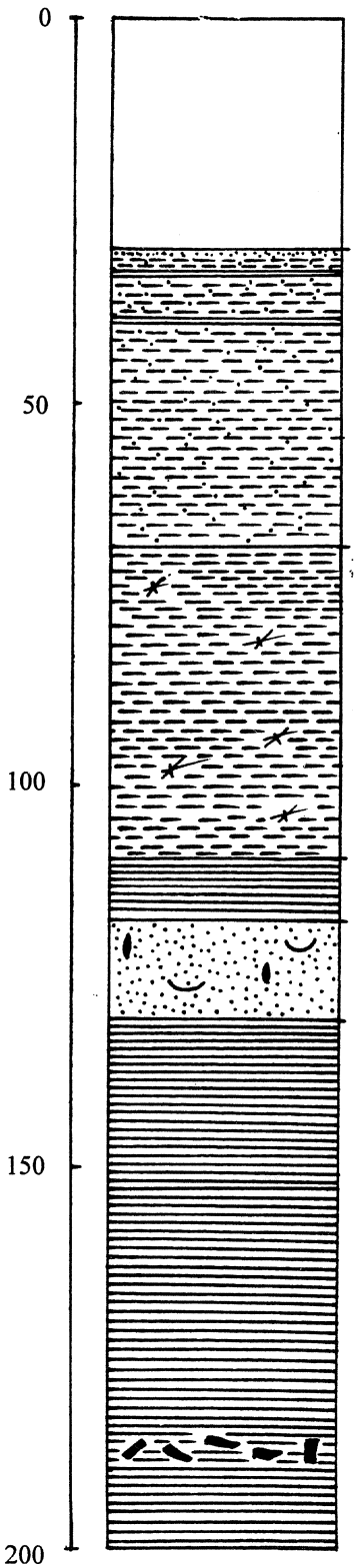
The sampling site is situated in the alluvium of the Vliet, approximately 2km north-east of Puurs. Puurs is a village in the southern part of the province of Antwerpen. The top 30cm of this profile is an artificially raised horizon. Wood occurs in the deepest section of the profile.



Coordinates:	51° 06' 03''	N	Map scale:	(1:25000)
	04° 18' 15''	E	Map number:	23/1-2
Altitude:	4	m	Date:	26/08/1992

Vliet **Profile 11024**

Profile description



0-30cm : Artificially raised ground level

30-69cm : Brown, sandy silt with iron oxide spots and with a thin layer of fine grained, white sand and two thin, black coloured clay layers

69-110cm : Brownish grey silt with iron oxide spots

110-118cm : Black coloured clay

118-131cm : Black, humus rich sand with shells and coal fragments

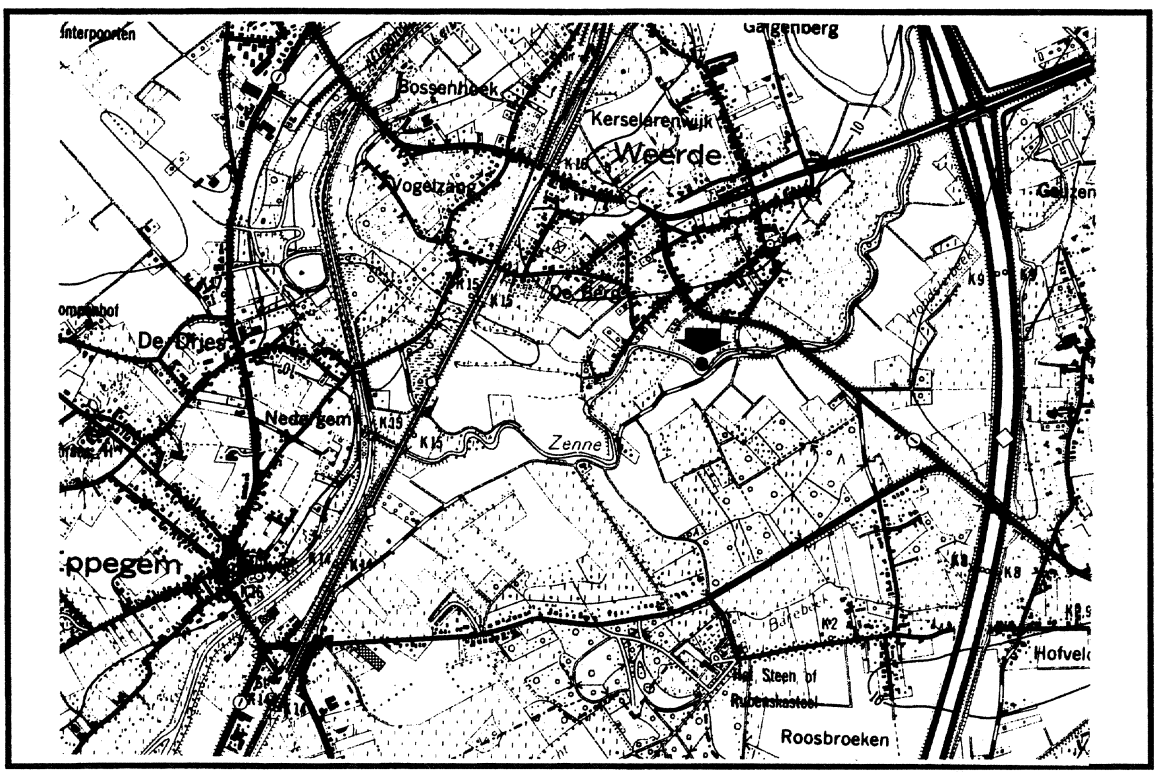
131-200cm : Homogeneous, grey coloured clay, rich in wood between 185 & 190cm depth

U-sample: 44-68 cm

L-sample: 131-151 cm

Sampling location

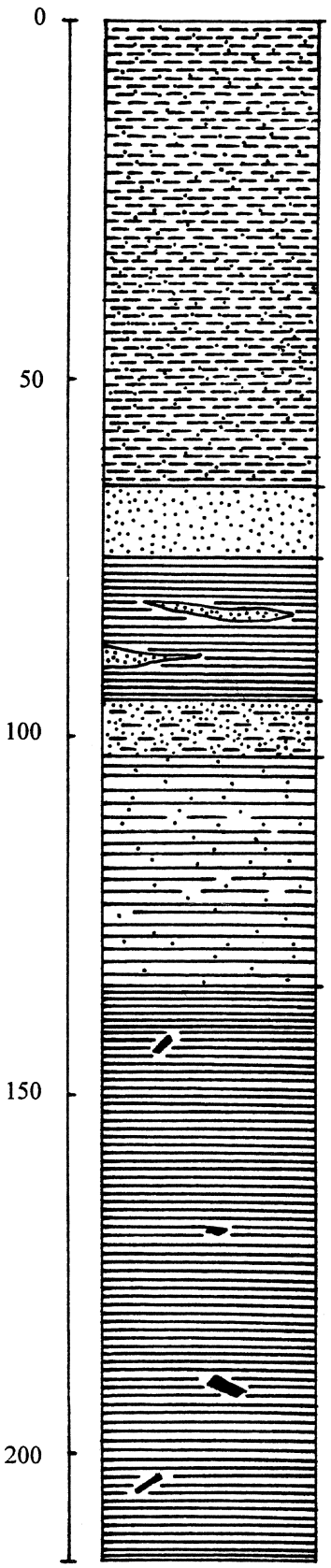
This sampling site along the Zenne is situated on the southern outskirts of the village of Weerde in northern Vlaams-Brabant and about 15km north-east of Brussels. The rooting zone is shallow since this piece of land is used to cultivate corn.



Coordinates:	50° 58' 09''	N	Map scale:	(1:25000)
	04° 28' 41''	E	Map number:	23/7-8
Altitude:	9	m	Date:	08/09/1992

Zenne **Profile 11025**

Profile description



0-65cm : Dark brown, sandy silt

65-75cm : Light brown sand

75-95cm : Dark brown clay with thin lenses of brown sand

95-103cm : Alternating layers consisting of dark brown, silty sand and layers of light brown sand

103-135cm : Dark to light brown coloured, sandy clay with a thin layer of black sandy clay (between 113 & 114cm depth)

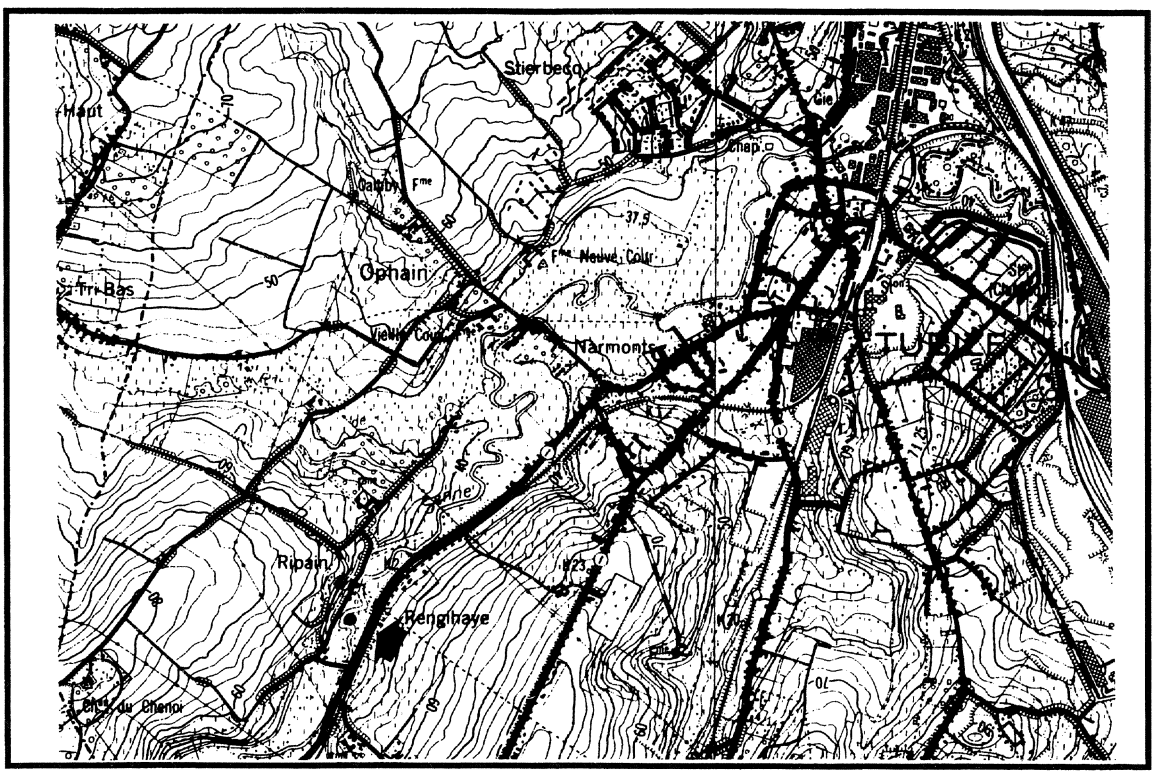
135-215cm : Greyish black clay with small fragments of wood scattered throughout the layer

U-sample: 44-68 cm

L-sample: 135-151 cm

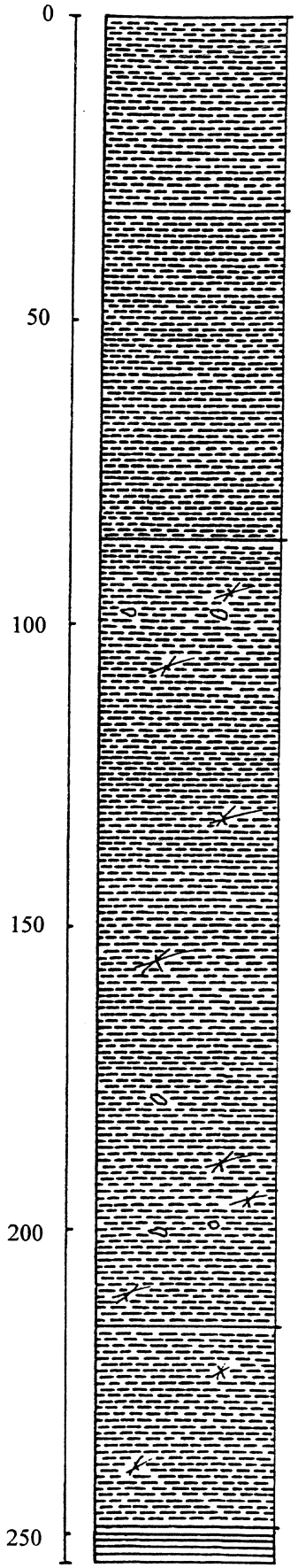
Sampling location

The second profile on the 'Senne' is located in the neighbourhood of Tubize near the provincial border between Brabant Wallon and Hainaut. The site is located 2km south-west of the station of Tubize. A coarsening upward trend is present throughout the entire profile. The rooting zone is 30cm deep.



Coordinates:	50° 40' 54''	N	Map scale:	(1:25000)
	04° 11' 01''	E	Map number:	39/1-2
Altitude:	40	m	Date:	20/08/1992

Senne **Profile 11026**



Profile description

0-32cm : Humus rich, dark brown to black coloured silt

32-86cm : Homogeneous, light brown coloured silt

86-216cm : Light brown coloured, mottled silt with spots of iron oxide and dispersed pieces of slate

216-249cm : Orange brown coloured, clay rich silt

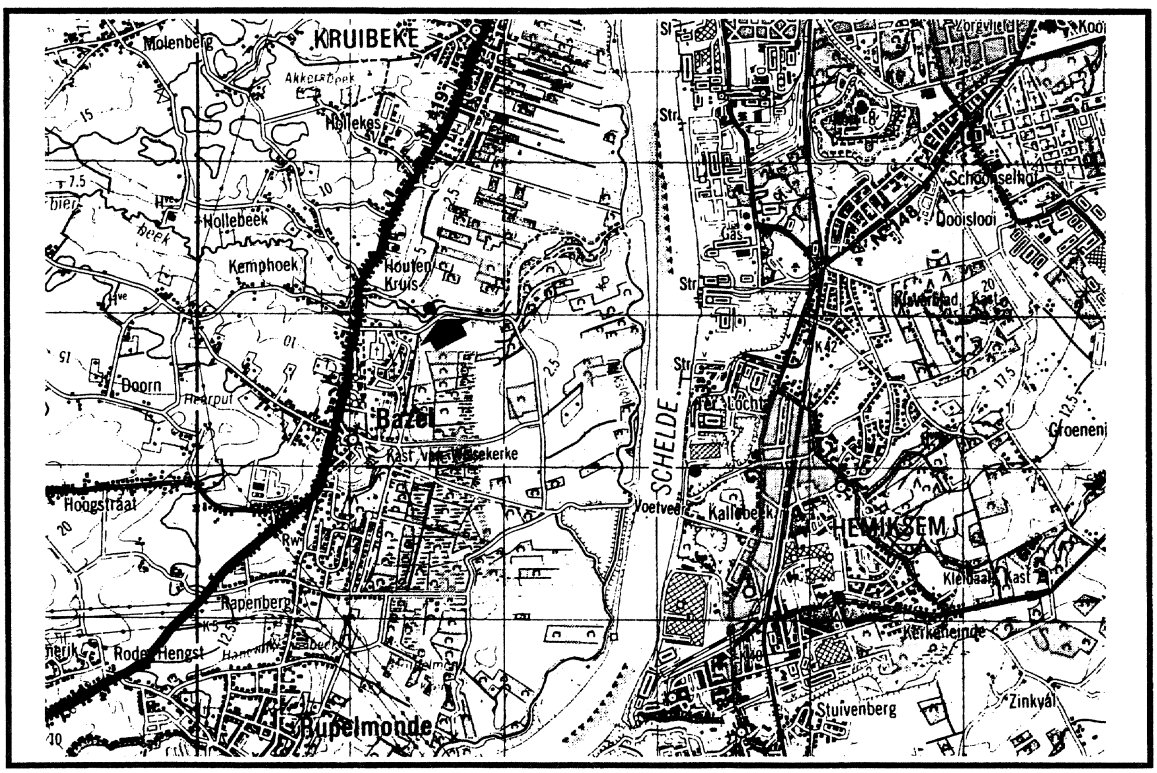
U-sample: 30-50 cm

L-sample: 249-277 cm

249-277cm : Greyish green clay

Sampling location

The alluvium of the Barbierbeek is sampled 1km to the north by north-east from the village of Bazel, in the province of Oost-Vlaanderen, 9km south-west of Antwerp. The lower reaches of the Barbierbeek are incorporated in a 'potpolder'. This polder basin is designed to flood in case of a high water stand in the Scheldt into which the Barbierbeek discharges. The actual sampling has been done 50m west of the sluice, controlling the access of the Barbierbeek into the 'potpolder'. Roots occur only in the top 15cm.

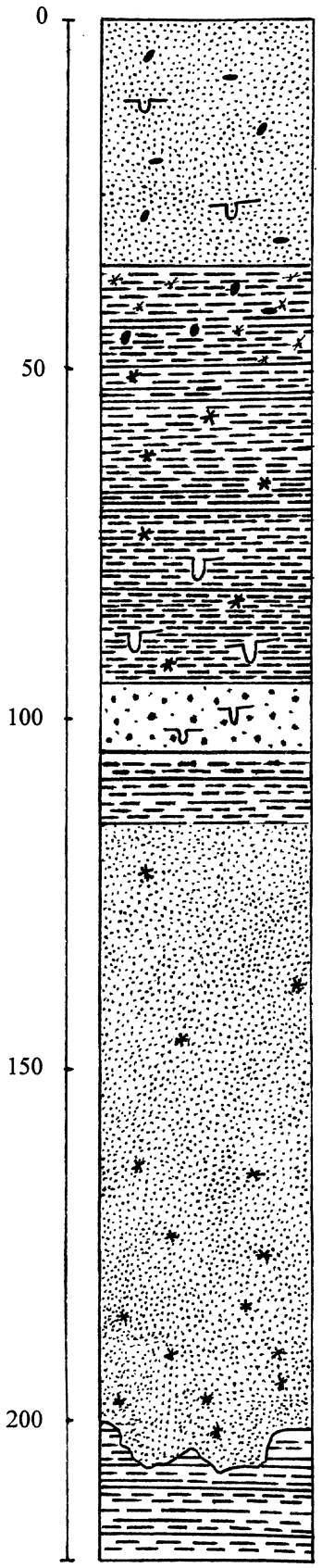


Coordinates:	51° 09' 18''	N	Map scale:	(1:50000)
	04° 18' 27''	E	Map number:	15
Altitude:	2	m	Date:	21/10/1992

Barbierbeek

Profile 11027

Profile description



0-35cm : Fine grained, brown coloured, sand with light brown coloured sand filling bioturbation cavities

35-95cm : Rusty to brown coloured clay rich silt with small iron oxide spots, between 35 and 50cm depth occur small coal fragments (diameter 3mm) while in the same interval iron oxide spots are more abundant

95-105cm : Fine to medium grained sand which is partially bioturbated

105-115cm : Clay rich silt

115-200cm : Fine grained sand with manganese nodules (diameter 2mm) occurring randomly and with iron oxide spots becoming bigger and more abundant with increasing depth

200-210cm : Erosive ? contact

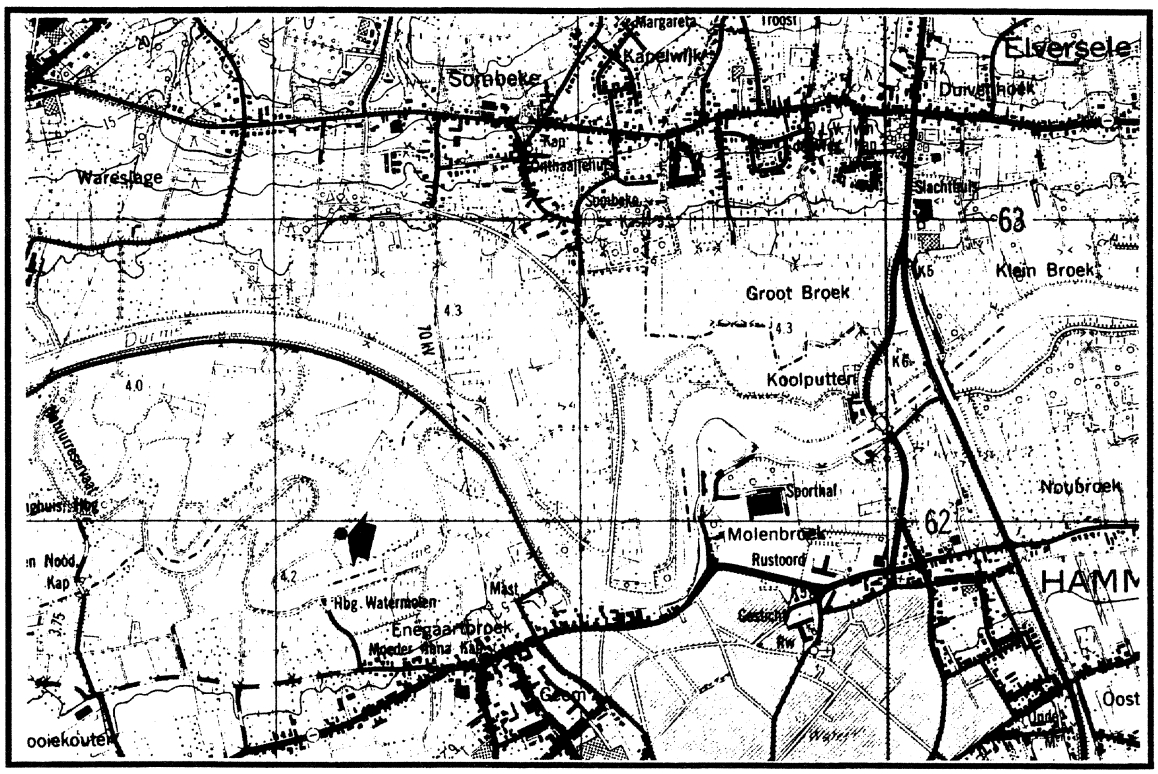
210-220cm : Grey, clay rich silt with scarce iron oxide spots

U-sample:	10-35	cm
L-sample:	170-190	cm

Durme **Profile 11028**

Sampling location

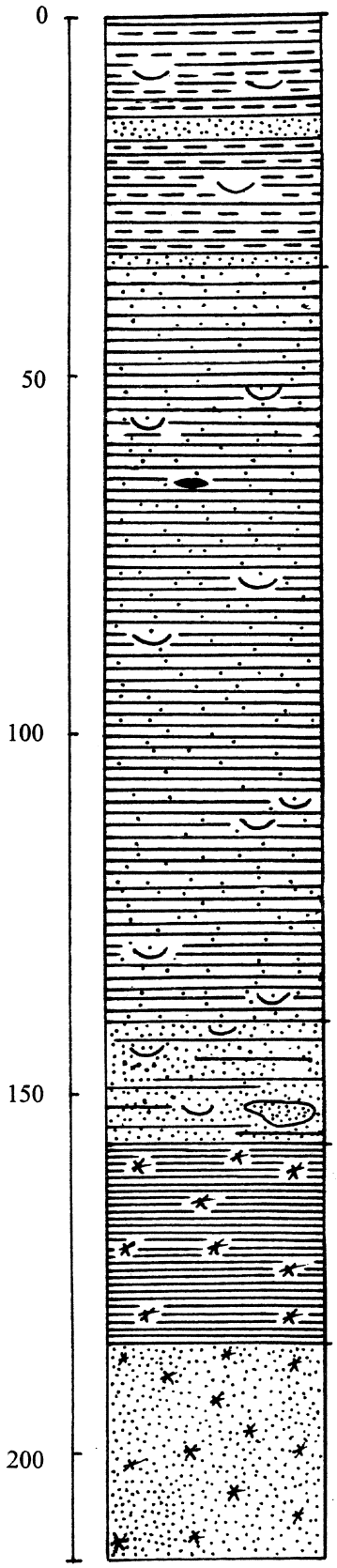
The sampling of Durme sediments was done along the 'Oude Durme' because of extensive strengthening of the banks of the Durme with concrete. The 'Oude Durme' consists of a group of meanders to the west of Hamme in the province of Oost-Vlaanderen. This part of the ancient river has been cut off from the present water flow several decades ago. Roots occur to a depth of 30cm.



Coordinates:	51° 06' 10''	N	Map scale:	(1:25000)
	04° 07' 03''	E	Map number:	15/5-6
Altitude:	5	m	Date:	09/09/1992

Durme **Profile 11028**

Profile description



0-35cm : Brown, silty clay with small shells and two intercalations, one of brown sand (between 14 & 17cm deep) and one of whitish grey sand (between 33 & 35cm depth)

35-140cm : Homogeneous, brown, sandy clay with small shells and brick fragments. The interval becomes increasingly sandy towards the top

140-157cm : Brown, clay rich sand with small shells and with lenses of brown medium sand

157-185cm : Greyish brown clay with iron oxide spots

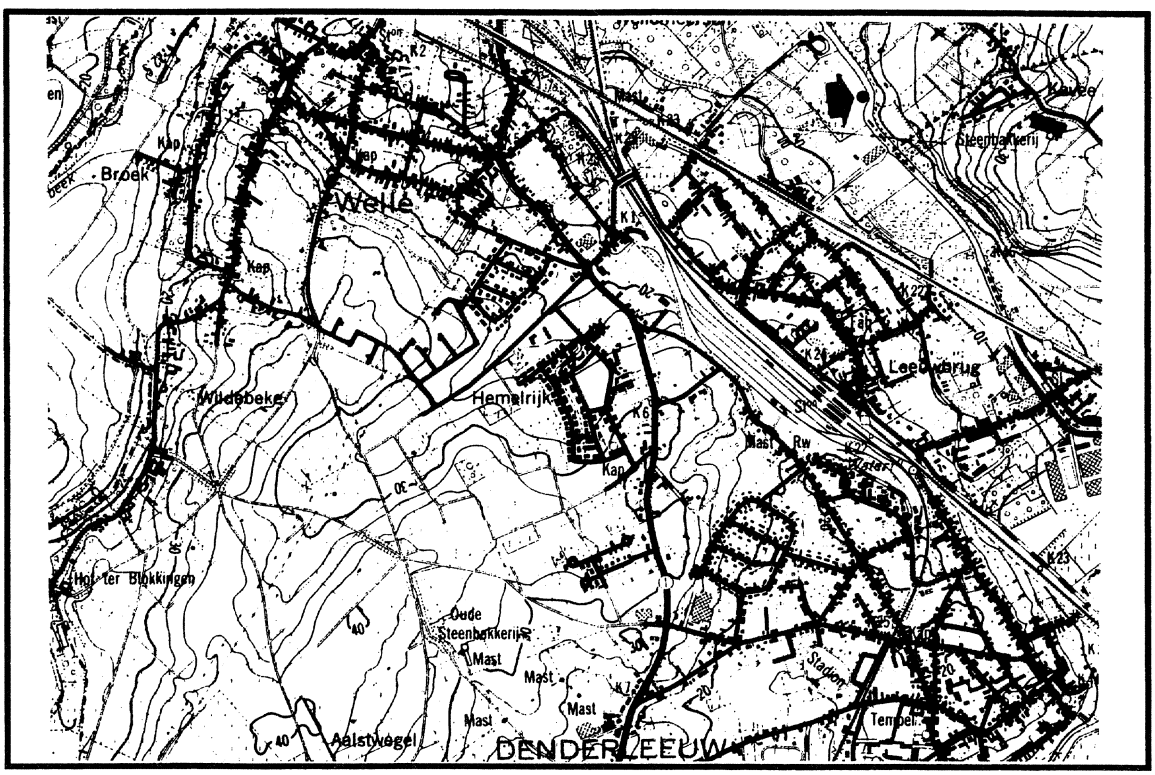
185-215cm : Medium brown sand with iron oxide spots

U-sample: 20-40 cm

L-sample: 185-215 cm

Sampling location

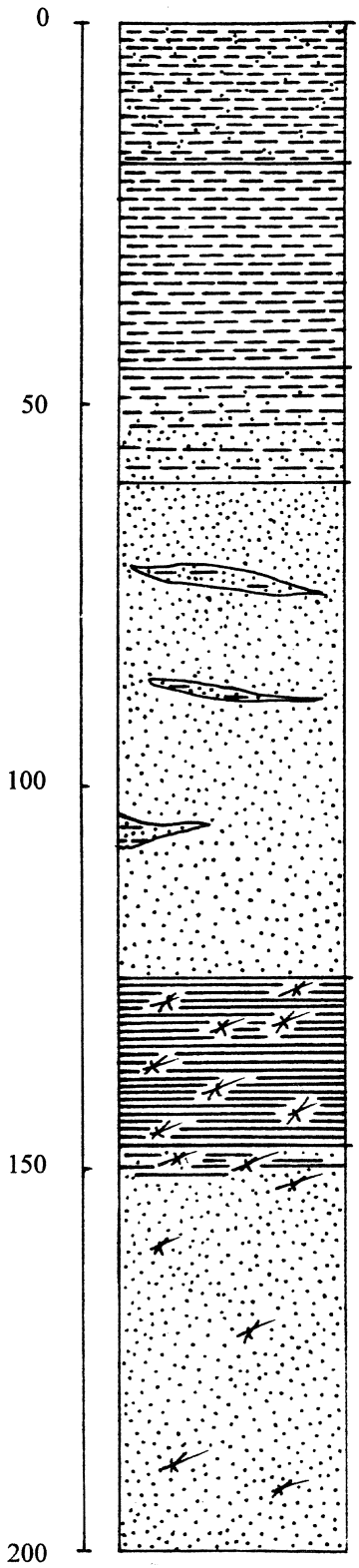
The sampling of the Dender took place at a location approximately 1.9km due east of Welle and 1km due north of the station of Denderleeuw. Just south from this location the Dender forms the provincial border between Oost-Vlaanderen and Vlaams-Brabant. The rooting zone is 20cm deep.



Coordinates:	50° 54' 07''	N	Map scale:	(1:25000)
	04° 04' 27''	E	Map number:	30/3-4
Altitude:	10	m	Date:	24/08/1992

Dender **Profile 11029**

Profile description



0-18cm : Humus rich, brown coloured sandy silt

18-45cm : Light brown silt

45-60cm : Brown silt to silty sand

60-125cm : Medium grained, grey sand with iron oxide spots and lenses of brown, silty sand

125-147cm : Rusty coloured clay

147-200cm : Medium grey sand with iron oxide spots at the top

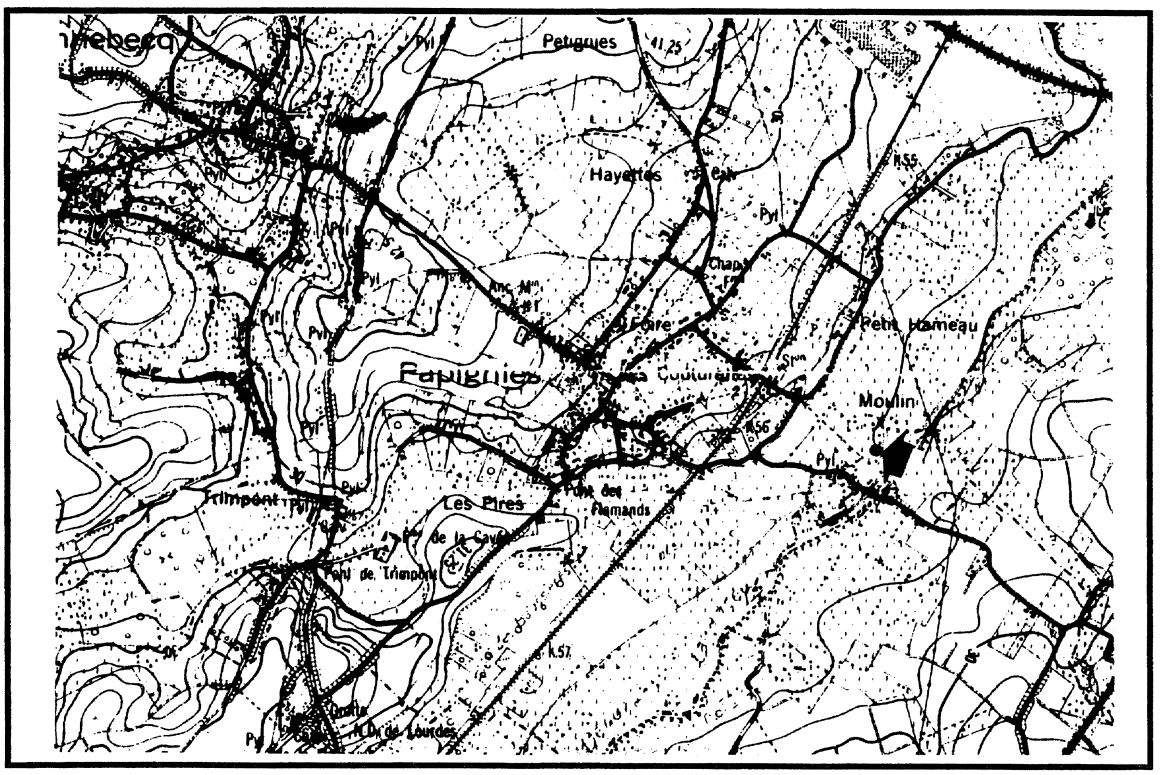
U-sample: 0-45 cm

L-sample: 147-176 cm

Dendre **Profile 11030**

Sampling location

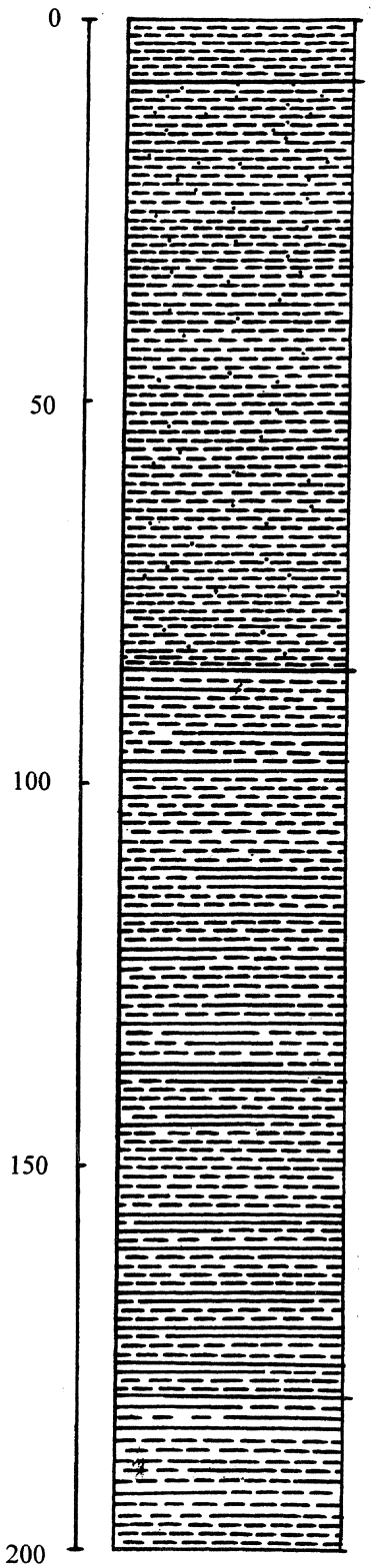
The upper reaches of the Dendre are sampled in the northern part of Hainaut, approximately 1km east of Papignies. As in the case of the Durme, the sampling was done on a cut off meander ('Ancienne Dendre'), which has been partially isolated from the main water flow since canalisation in 1865. Roots occur in the top 30cm.



Coordinates:	50° 41' 07''	N	Map scale:	(1:25000)
	03° 49' 48''	E	Map number:	38/1-2
Altitude:	22	m	Date:	14/09/1992

Dendre **Profile 11030**

Profile description



0-8cm : Humus rich, dark brown silt

8-85cm : Homogeneous, light brown, sandy silt

85-180cm : Greyish brown, mottled, clay rich silt

180-210cm : Greyish green, sandy and clay rich silt

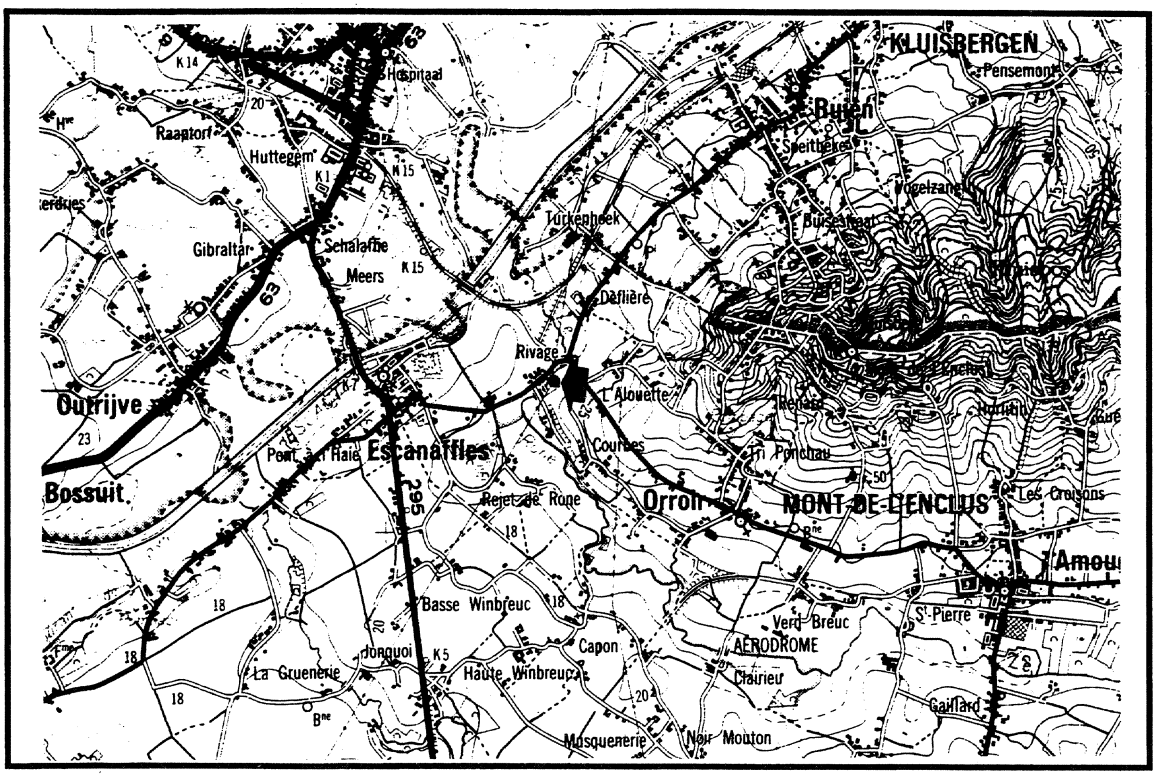
U-sample: 10-30 cm

L-sample: 190-210 cm

Rhosnes **Profile 11032**

Sampling location

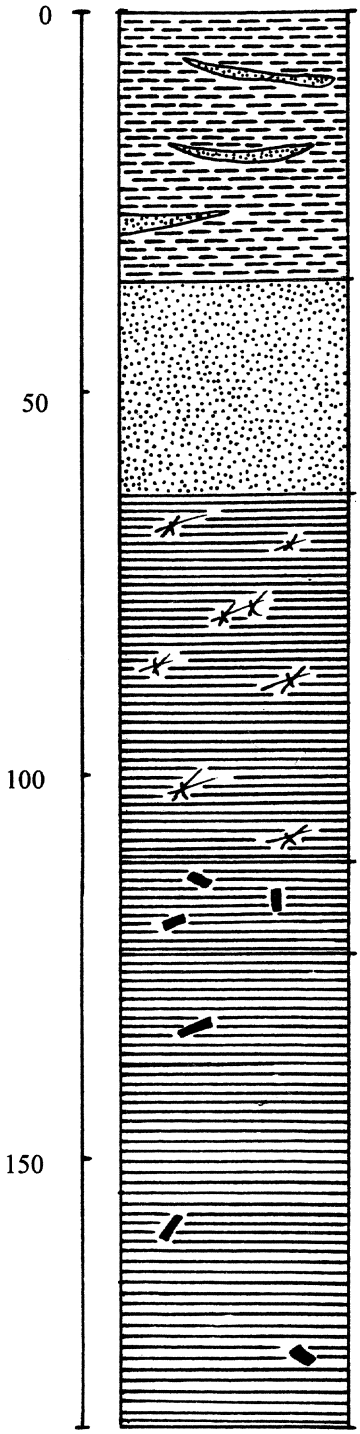
The Rhosnes, a small tributary of the Scheldt was sampled 1km east of Escanaffles in northern Hainaut. The river banks are strengthened by rocks and wooden beams. A potential risk of contamination of the pre-industrial sediments exists due to public works and erosion of the banks. The rooting zone is 30cm deep.



Coordinates:	50° 45' 19''	N	Map scale:	(1:25000)
	03° 27' 47''	E	Map number:	29/7-8
Altitude:	12	m	Date:	27/08/1992

Rhosnes **Profile 11032**

Profile description



0-35cm: Brown to brownish black silt with white sand lenses

35-63cm: Medium grained, beige sand with thin humus rich zones

63-111cm : Rusty coloured clay with dark brownish grey zones. Plastic occurs at 85cm depth

111-123cm : Greyish green clay with wood fragments

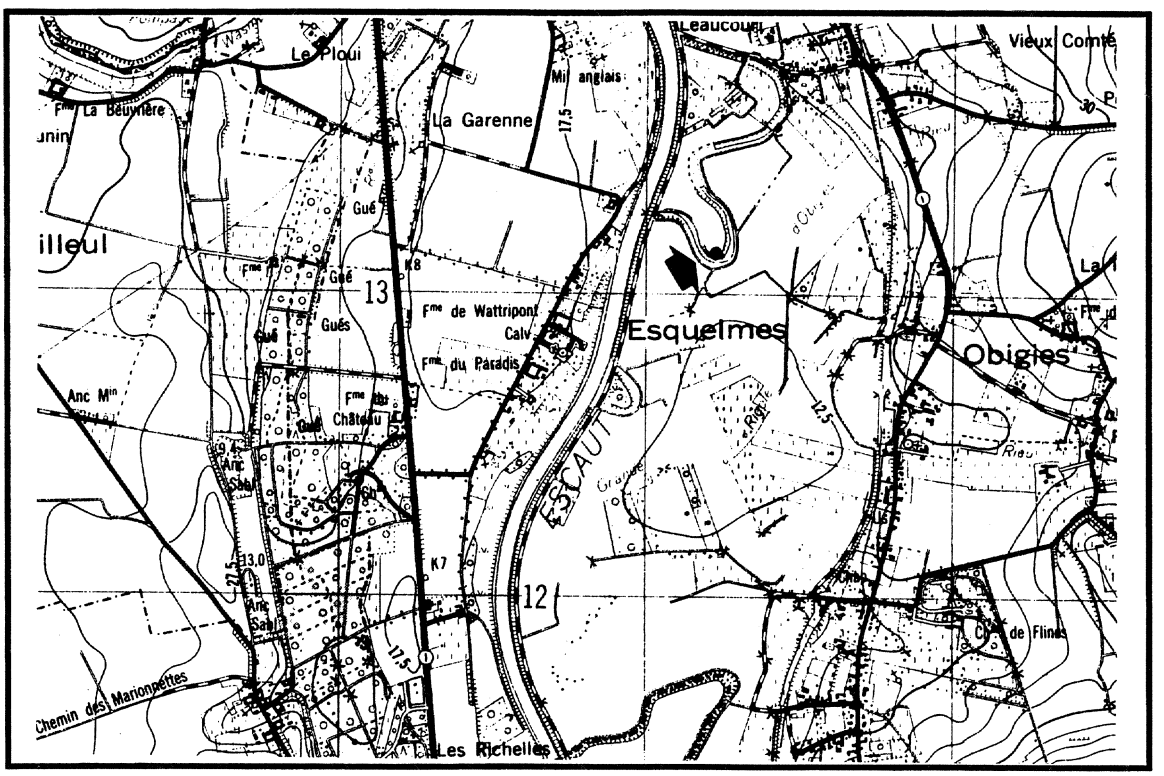
123-185cm : Homogeneous, dark grey clay with wood fragments and pieces of plastic (the latter may have been washed into the profile when erosion undercut the banks of the river)

U-sample: 15-34 cm

L-sample: 159-180 cm

Sampling location

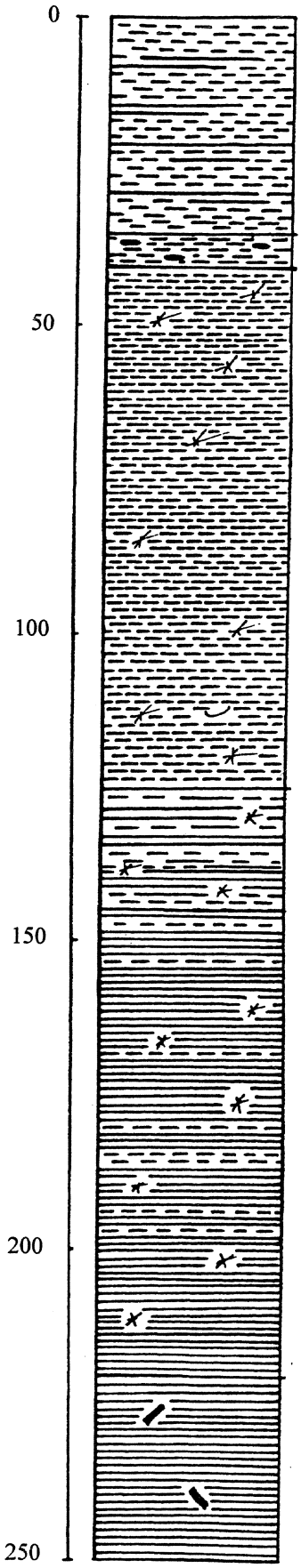
The 11033 profile is situated in western Hainaut, 10 km north of Tournai. Recent canalisation works made it impossible to sample the present river sediments. However samples were gathered along a cut off meander, north-east of Ramegnies-Chin (municipality of Pecq). The rooting zone is 20cm deep.



Coordinates:	50° 40' 09''	N	Map scale:	(1:25000)
	03° 21' 26''	E	Map number:	37/1-2
Altitude:	13	m	Date:	16/10/1992

Escaut (Scheldt) **Profile 11033**

Profile description



0-36cm : Brown, clay rich silt

36-40cm : Dark brown silt with slags

40-127cm : Light brown, sandy silt with iron oxide spots and thin laminae of beige silt

127-224cm : Light brown, silty clay with iron oxide spots

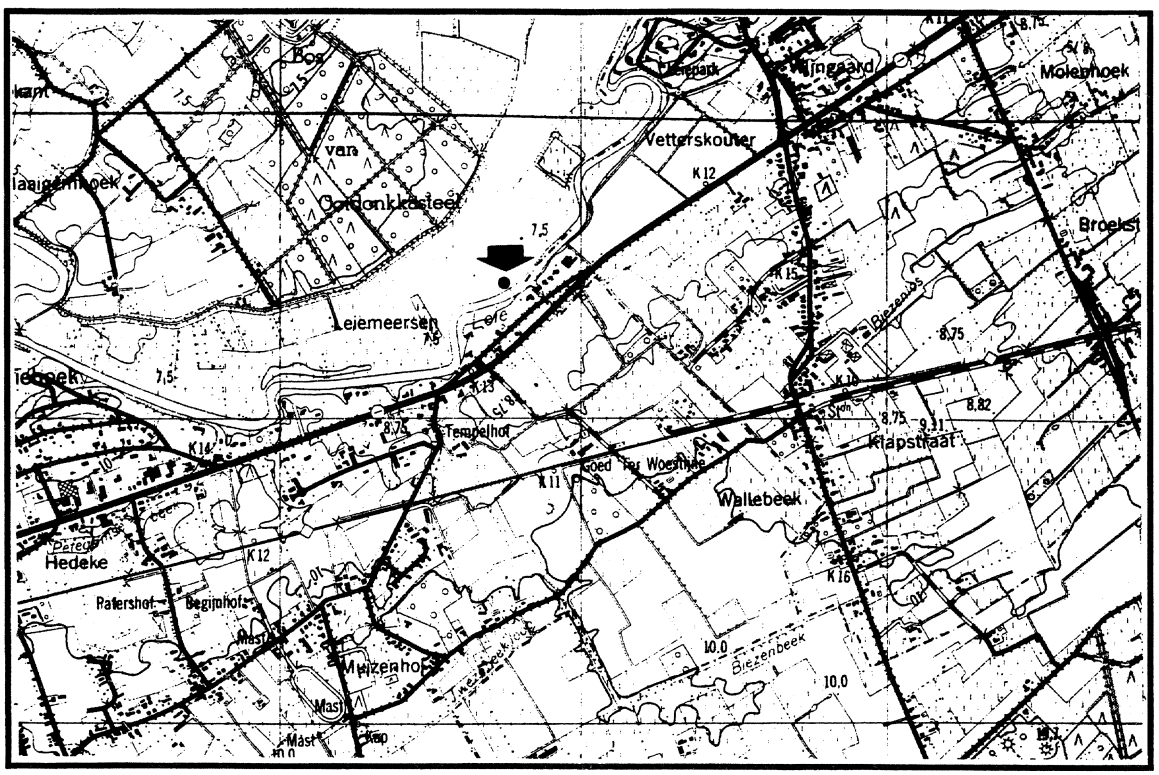
224-250cm : Greyish green clay with wood fragments

U-sample: 40-60 cm

L-sample: 230-250 cm

Sampling location

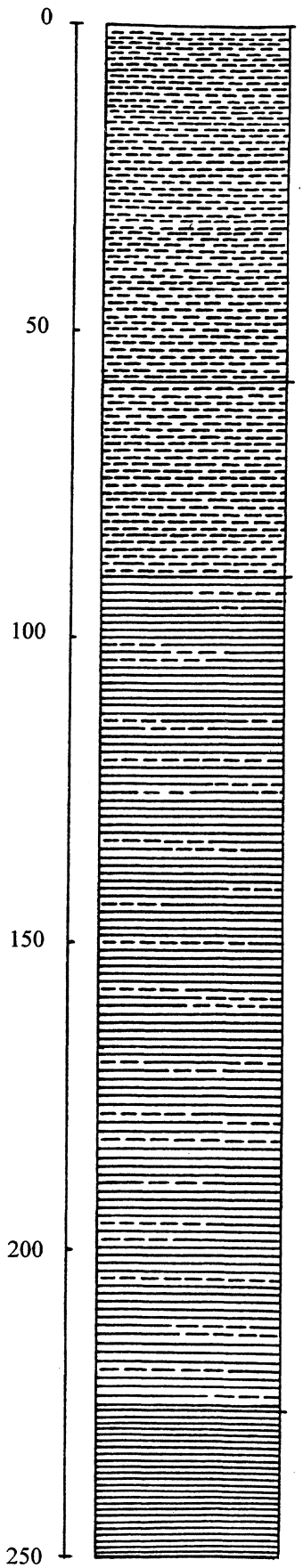
Sampling site 11034 is located 2 km south-west of Deurle, near the castle of Ooidonk, situated half way between Ghent and Deinze (province of Oost-Vlaanderen). The rooting zone is 20cm deep.



Coordinates:	50° 59' 39''	N	Map scale:	(1:25000)
	03° 35' 41''	E	Map number:	21/7-8
Altitude:	8	m	Date:	21/08/1992

Leie **Profile 11034**

Profile description



0-58cm : Homogeneous, brown, sandy silt

58-90cm : Homogeneous, light brown, sandy silt with charcoal fragments

90-226cm : Light grey, mottled, silty clay

226-247cm : Homogeneous brownish grey clay

U-sample: 26-58 cm

L-sample: 226-241 cm

Rivierbeek **Profile 11037**

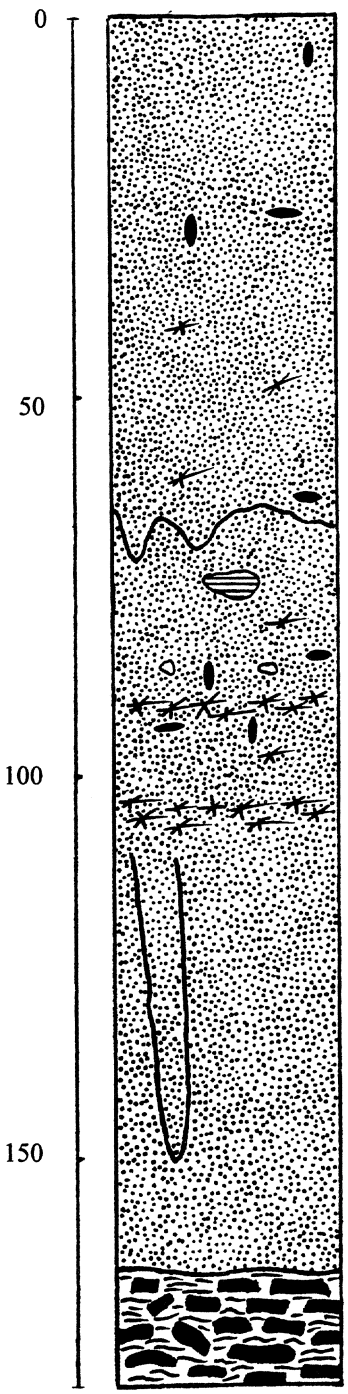
Sampling location

The Rivierbeek is a small river, situated in a wooded area at Oostkamp, south of Bruges. The profile is remarkable because of the presence of a 20cm thick, saturated layer of wood and leaves (sweet chestnut, beech,...) and because of the presence of human ground traces. Sweet chestnut is a relative age indicator, since it is believed that this species was introduced in Belgium by the Romans. The rooting zone is 10cm deep.



Coordinates:	51° 07' 37''	N	Map scale:	(1:50000)
	03° 14' 08''	E	Map number:	21
Altitude:	15	m	Date:	26/10/1992

Profile description



0-75cm : Brown sand with thin lenses of beige sand. Charcoal, brick fragments, iron oxide spots and rounded pieces of iron sandstone occur sporadically

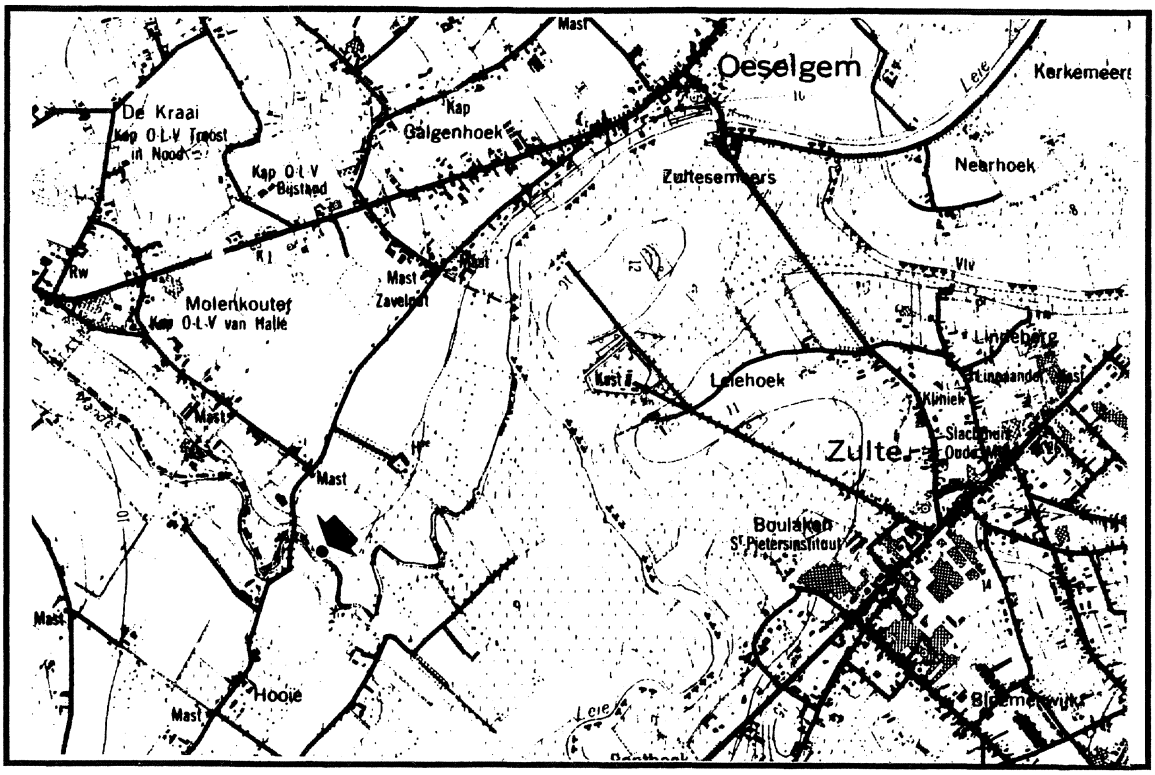
75-165cm : Dark brown to beige or light grey sand with an irregular lamination. Some zones are being lithified by iron oxide. Charcoal, brick fragments, silex gravel and pockets of clay occur at the top. Between 110 and 150cm depth occur apparently human made ground traces

165-180cm : Black to dark brown coloured layer of wood and leaves (beech? & sweet chestnut; of the latter nuts were found as well)

U-sample:	0-25	cm
L-sample:	145-165	cm

Sampling location

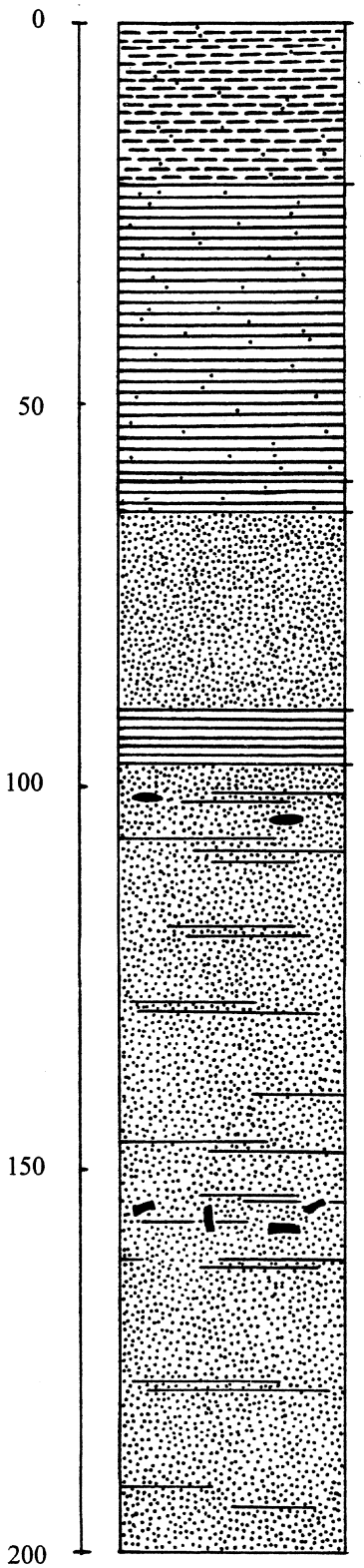
The 11038 profile along the lower reaches of the Mandel is located near the village of Wakken in the province of West-Vlaanderen. Roots occur to a depth of 10cm.



Coordinates:	50° 55' 17''	N	Map scale:	(1:25000)
	03° 24' 59''	E	Map number:	21/7-8
Altitude:	9	m	Date:	25/08/1992

Mandel **Profile 11038**

Profile description



0-21cm : Humus rich, brownish black, sandy silt

21-60cm : Light grey, mottled, sandy clay

60-64cm : Dark grey, sandy clay

64-90cm : Medium grained, whitish grey sand with thin, humus rich layers of sand

90-97cm : Dark brown clay

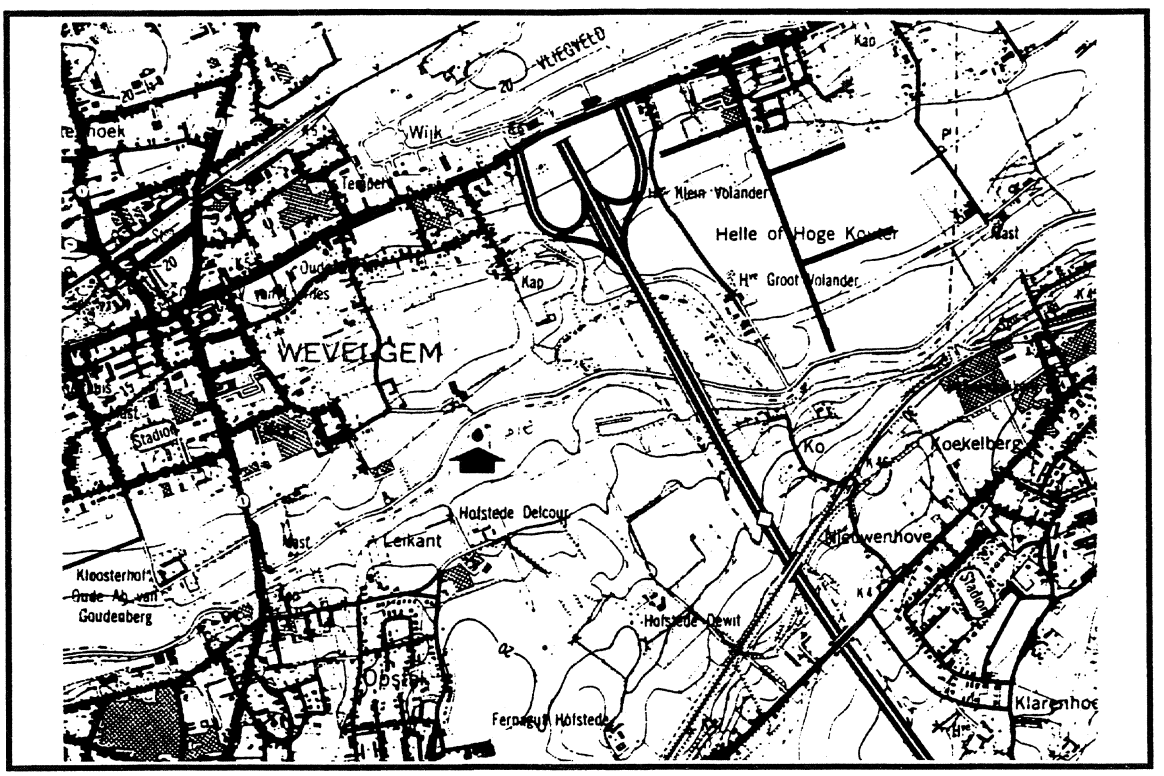
97-200cm : Greyish green, clay rich sand with a zone rich in wood between 155 & 165cm depth

U-sample: 20-50 cm

L-sample: 150-170 cm

Sampling location

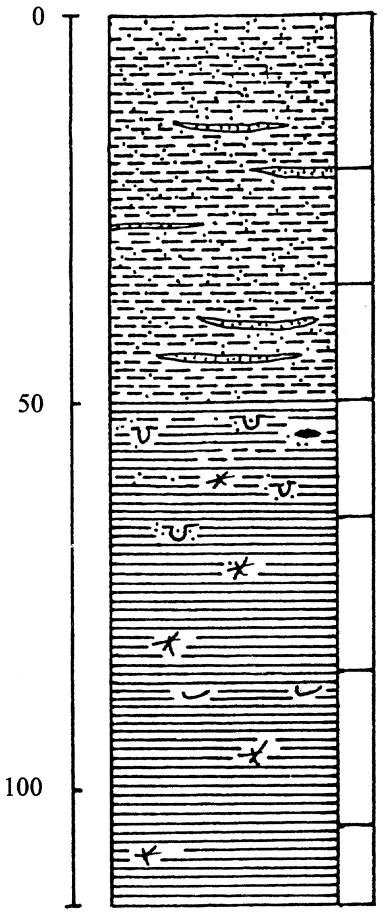
This profile is located 1km due south of the Wevelgem airfield, which is situated at some 6km south-west of Kortrijk in the province of West-Vlaanderen. The sampling site is located along a part of the river which has been cut off recently (1985), so the present situation is not indicated on the topographic map. These recent canalisation works are still continuing upstream.



Coordinates:	50° 48' 40''	N	Map scale:	(1:25000)
	03° 12' 01''	E	Map number:	29/1-2
Altitude:	12	m	Date:	5/11/1992

Leie **Profile 11039**

Profile description



0-50cm : Dark brown coloured, humus- and silt-rich sediment with thin sand layers

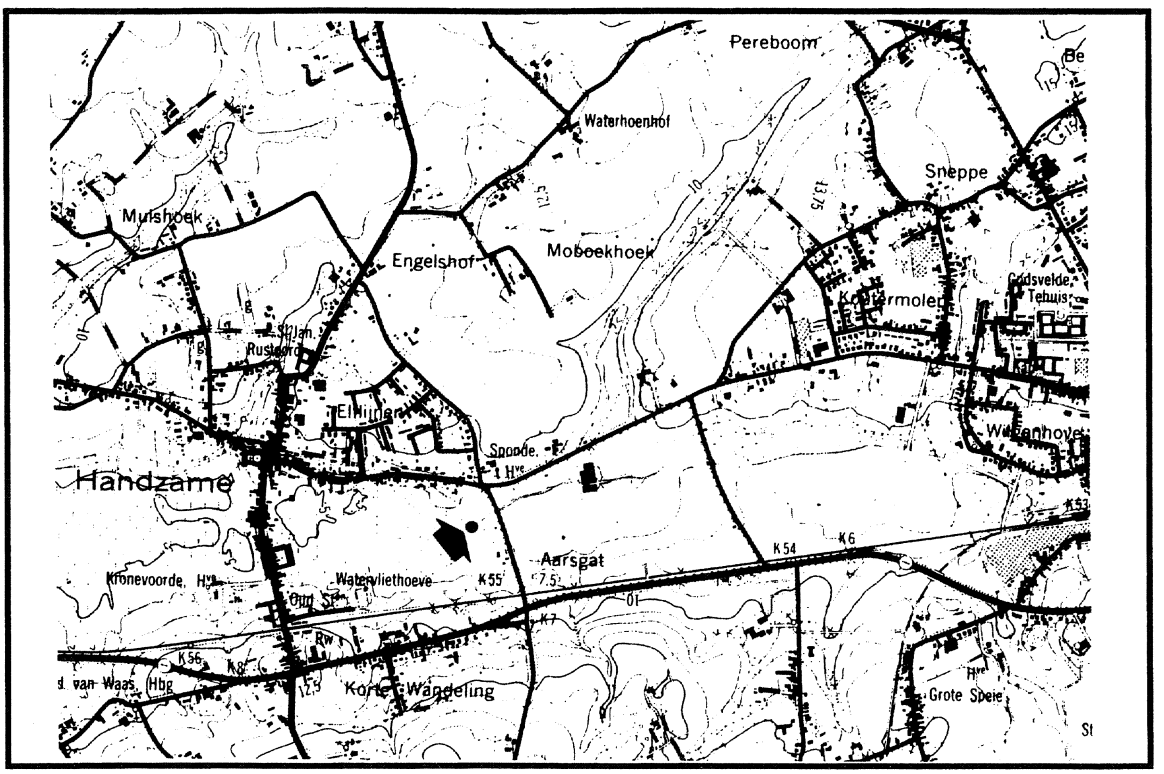
50-115cm : Grey to rusty brown coloured, silty clay with abundant Fe-oxide spots. The top part contains slags and bioturbations filled with brown material from above. The bottom part contains an horizon with swan-mussel shells

U-sample: 10-30 cm

L-sample: 95-115 cm

Sampling location

The Krekelbeek, a tributary of the IJzer has been sampled east of Handzame, because canalisation of the river made it impossible to sample further downstream. The village of Handzame is situated at some 10 km east of Diksmuide, in the province of West-Vlaanderen. The rooting zone is 10cm deep, with some tree roots going as deep as 2m.

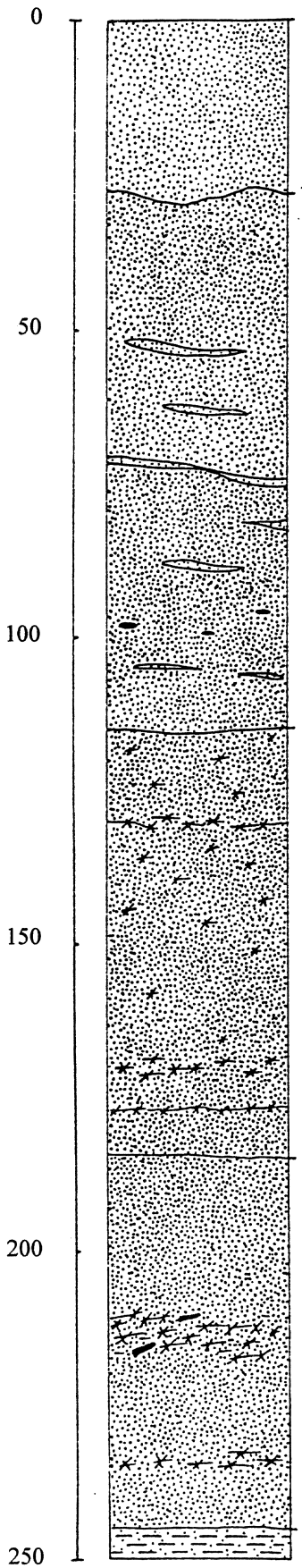


Coordinates:	51° 01' 31''	N	Map scale:	(1:25000)
	03° 00' 57''	E	Map number:	20/3-4
Altitude:	6	m	Date:	07/11/1992

Krekelbeek

Profile 11042

Profile description



0-30cm : Homogeneous, fine grained, whitish grey sand

30-115cm : Brown sand with brick fragments and lenses of beige sand under 50cm depth

115-185cm : Fine grained, light grey coloured sand with iron oxide spots which become less frequent with increasing depth. Zones of irregular thickness are being lithified by iron oxide

185-240cm : Humus rich, dark brown sand with a humid, rusty coloured and solidified zone of variable thickness in which wood fragments occur

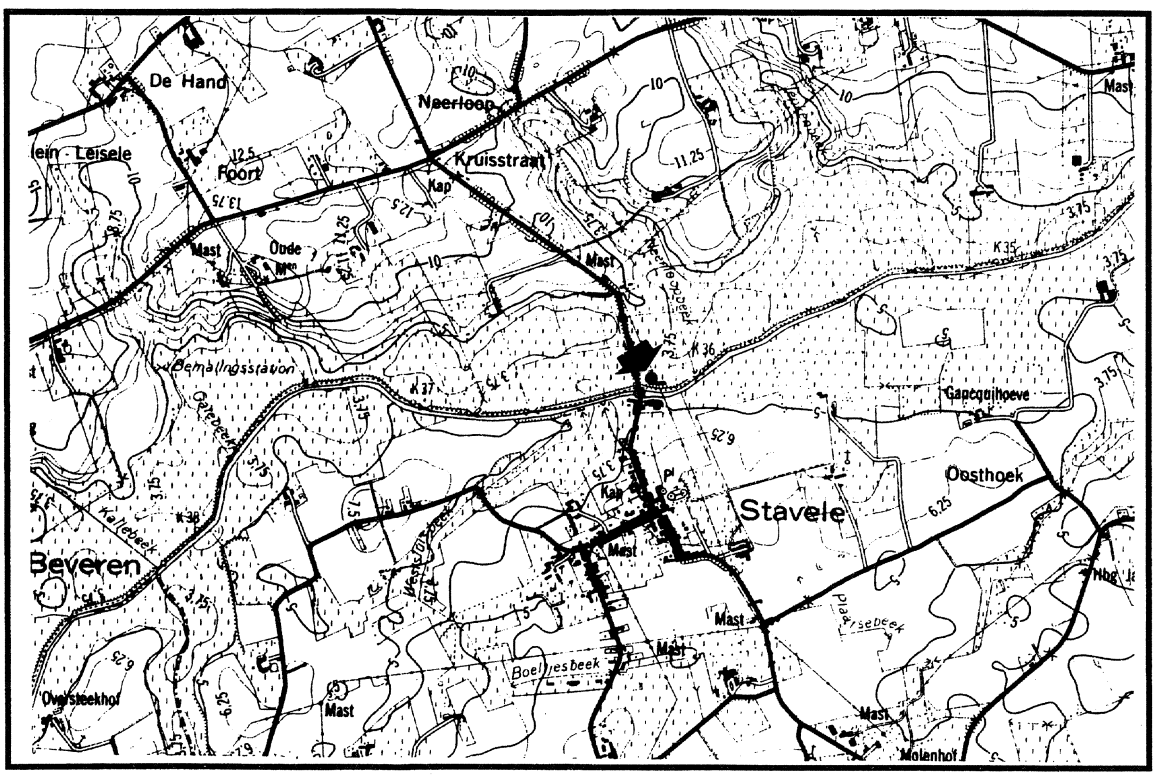
U-sample: 30-50 cm

L-sample: 220-245 cm

240-250cm : Humid, greyish green sand

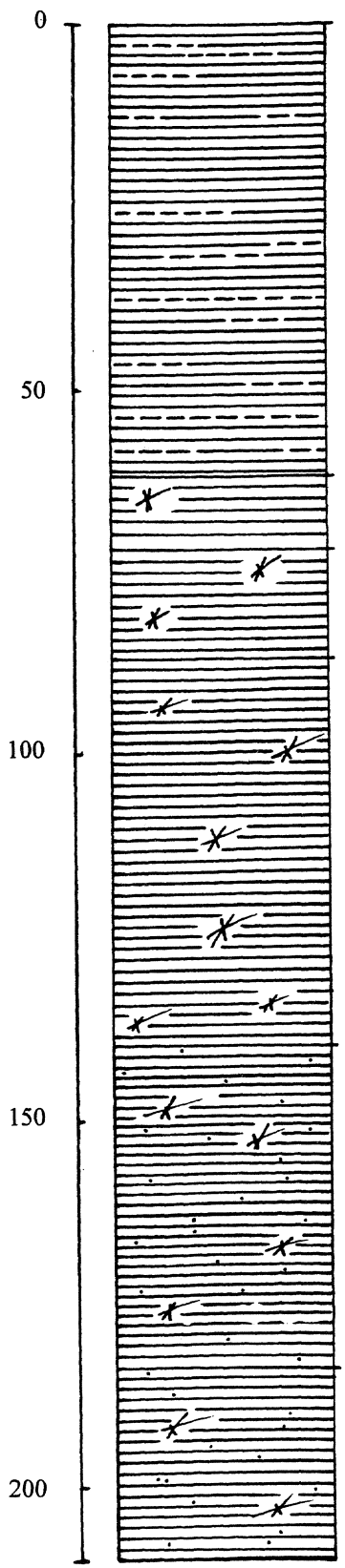
Sampling location

Sampling site 11043 along the IJzer is located in the province of West-Vlaanderen, near the French border, due north of the village of Stavele. Roots occur only in the top 10cm.



Coordinates:	50° 56' 43''	N	Map scale:	(1:25000)
	02° 40' 08''	E	Map number:	19/7-8
Altitude:	4	m	Date:	17/09/1992

Profile description



0-62cm : Homogeneous, dark brown, silty clay

62-72cm : Light brown clay with iron oxide spots

72-87cm : Dark grey clay with iron oxide spots

87-140cm : Light to dark grey, mottled clay with iron oxide spots

140-184cm : Finely laminated, brownish grey, sandy clay with iron oxide spots and thin laminae of humus rich zones

184-210cm : Similar as above but with a greyish green colour

U-sample: 32-52 cm

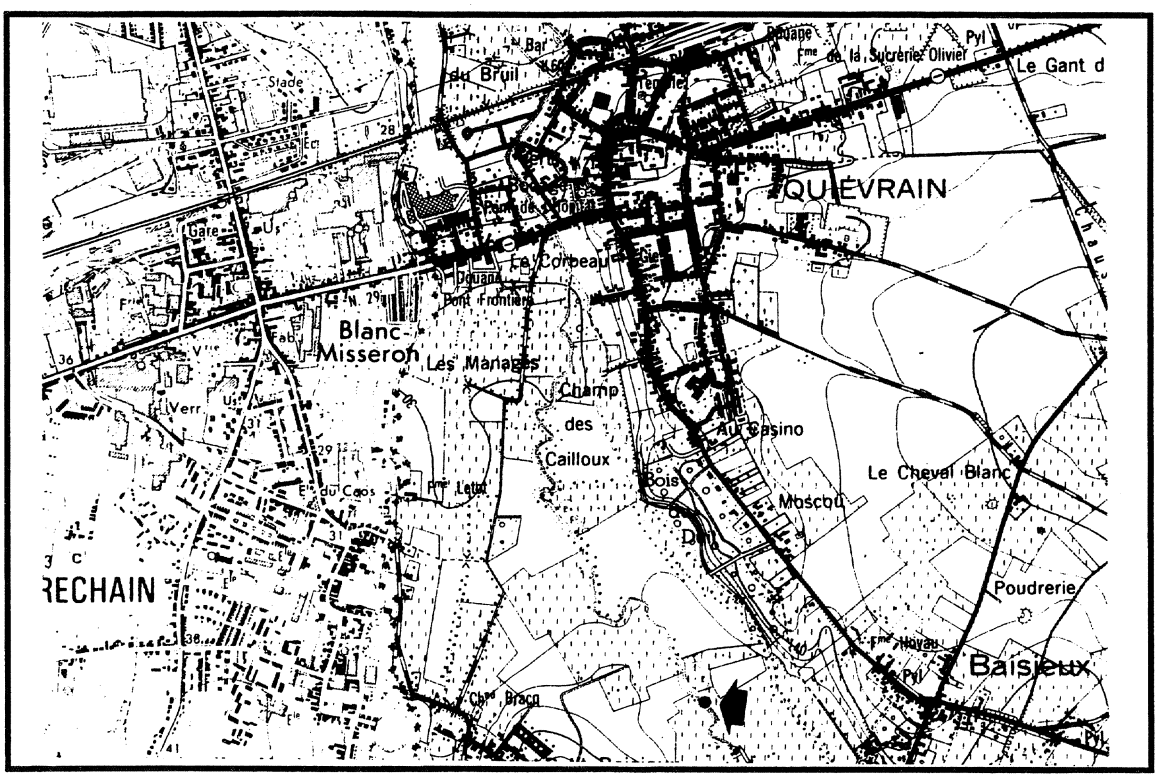
L-sample: 184-204 cm

Grande Honelle

Profile 11044

Sampling location

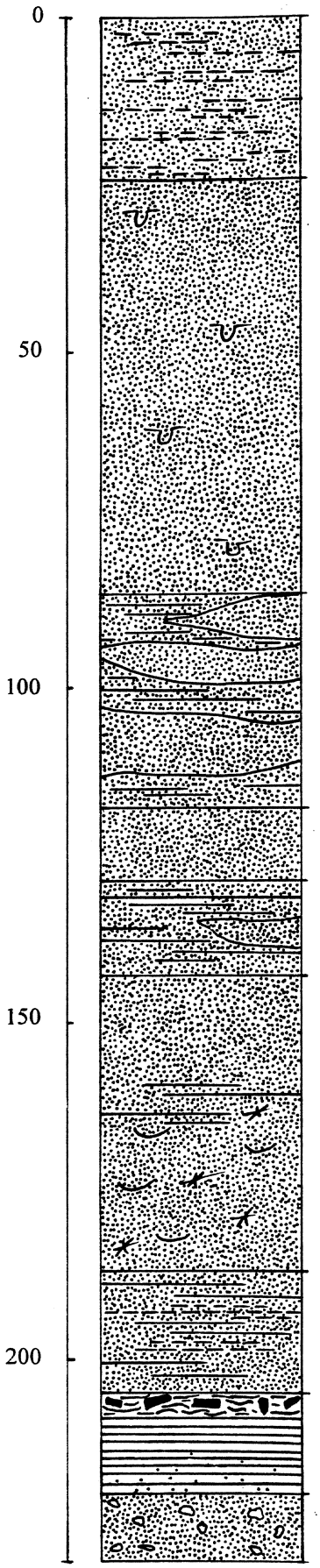
The 11044 profile in the Grande Honelle alluvium is located south of Quiévrain in Hainaut, 1km from the French border. This profile is characterised by thin (several cm thick) alternating layers of whitish, beige sand and brown, clay rich sand. The rooting zone is 20cm thick.



Coordinates:	50° 23' 23''	N	Map scale:	(1:25000)
	03° 41' 20''	E	Map number:	45/5-6
Altitude:	35	m	Date:	10/09/1992

Grande Honelle

Profile 11044



Profile description

0-24cm : Brown, silty sand with a lens of beige sand

24-86cm : Fine grained, greyish brown sand with bioturbation cavities filled by white sand

86-118cm : Alternating layers of whitish beige sand and brown, clay rich sand

118-129cm : Coarse grained, brown sand

129-143cm : Light grey, clay rich sand

143-187cm : Coarse grained, brown sand with pieces of iron wire in the uppermost 20cm and rich in shells and with iron oxide spots in the deepest 20cm. Between 164 & 166cm depth occurs a light grey, clay rich sand layer

187-205cm : Light grey, clay rich sand with thin rusty coloured silt layers

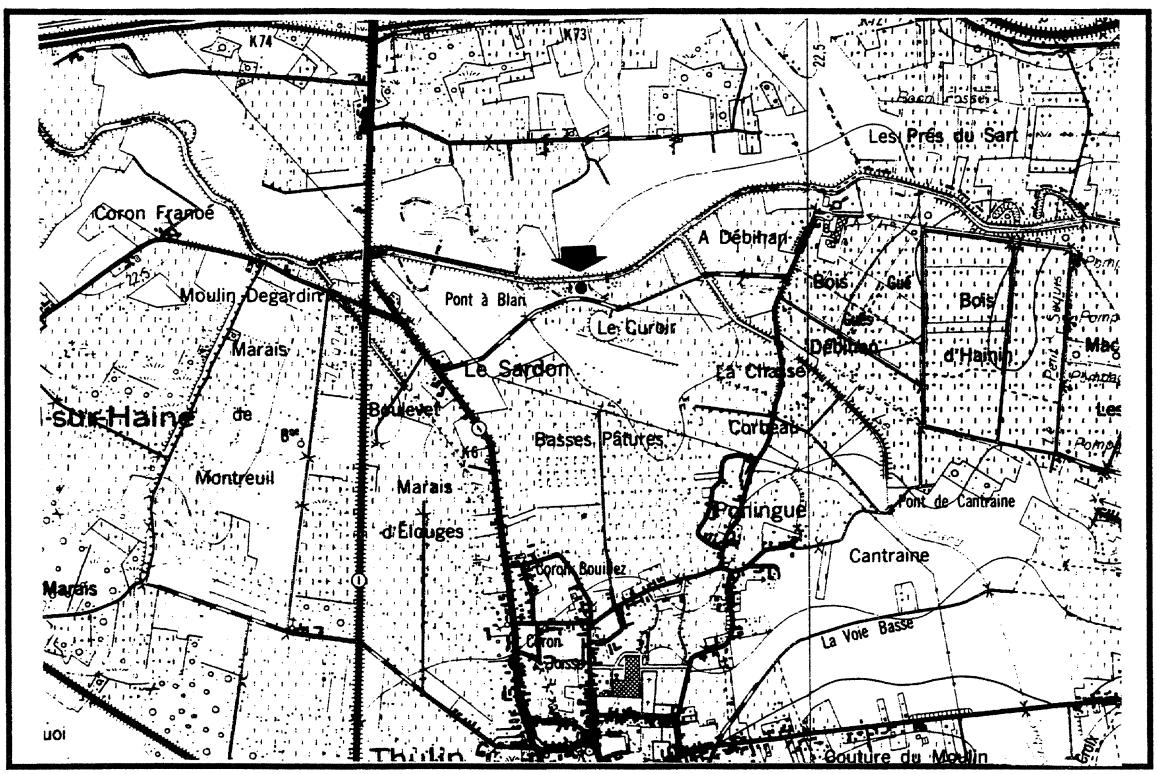
205-220cm : Dark grey, sandy clay fining up to dark grey clay. At the top occurs a 4cm thick layer of leafy peat containing pieces of wood

220-230cm : Very coarse sand containing gravel

U-sample:	0-24	cm
L-sample:	204-220	cm

Sampling location

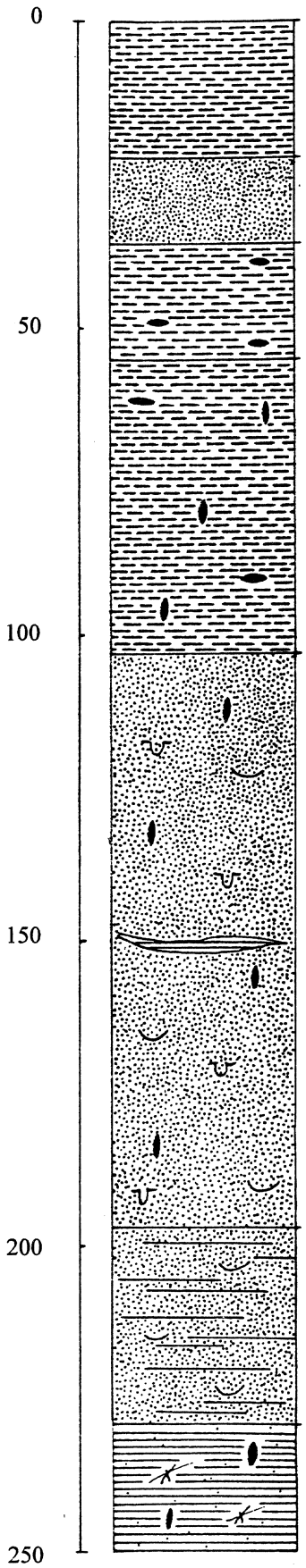
The sampling of the Haine alluvium was done north of Thulin in Hainaut. The rooting zone is 20cm thick.



Coordinates:	50° 26' 36''	N	Map scale:	(1:25000)
	03° 44' 22''	E	Map number:	45/5-6
Altitude:	25	m	Date:	11/09/1992

Haine **Profile 11045**

Profile description



0-22cm : Black silt

22-36cm : Brown sand

36-55cm : Black silt with brick fragments

55-103cm : Brown silt with brick and coal fragments

103-197cm : Medium grained, brownish grey to grey sand with coal fragments and bioturbation cavities filled by brown silt. At 150cm depth occur grey clay 'lenses'

197-229cm : Brownish grey, clay-rich sand with shells

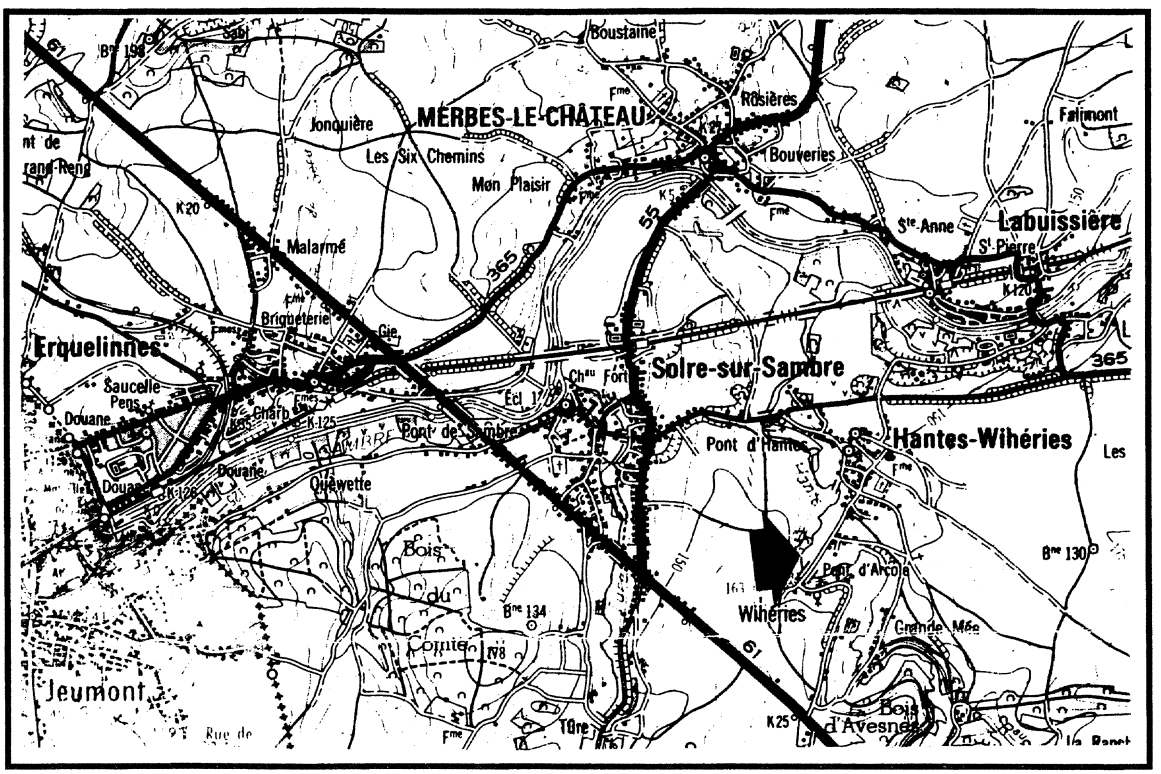
229-250cm : Grey, sandy clay with coal fragments and iron oxide spots

U-sample: 57-75 cm

L-sample: 197-229 cm

Sampling location

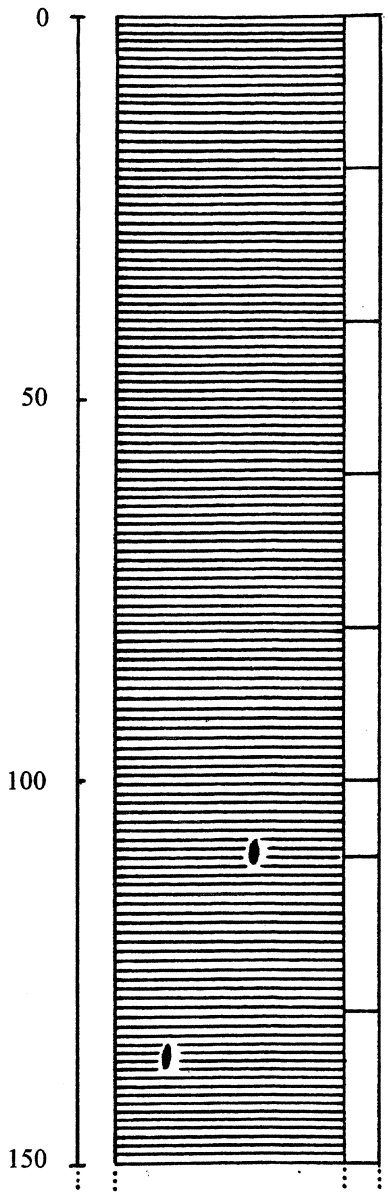
Sampling site 11046 along the Hantes is located close to the Arcole-Bridge in Hantes-Wiheries, some 4km east-south-east from Erquelinnes, which is situated in the province of Hainaut, near the French border, south-east of Mons.



Coordinates:	50° 18' 03''	N	Map scale:	(1:50000)
	04° 10' 30''	E	Map number:	52
Altitude:	146	m	Date:	27/06/1994

Hantes **Profile 11046**

Profile description



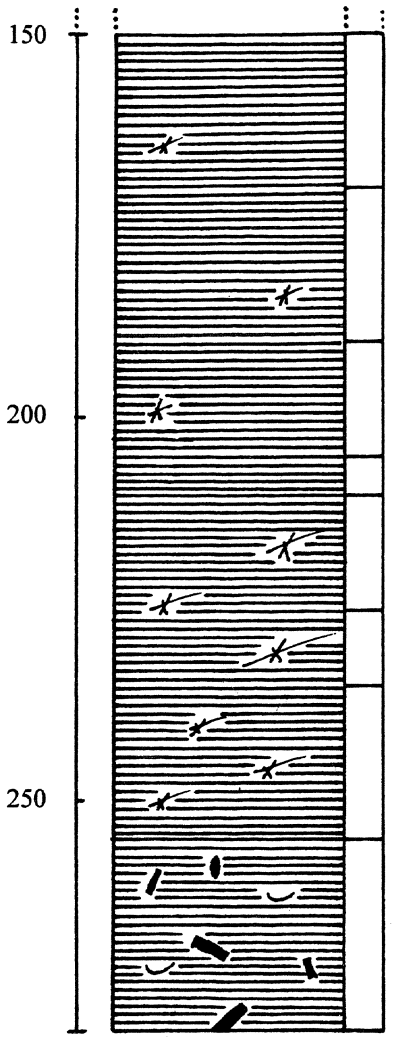
0-150cm : Brown coloured clay with small charcoal-like particles at depth > 100 cm

U-sample: 20-60 cm

L-sample: 260-280 cm

Hantes **Profile 11046**

Profile description (bis)



150-205cm : Clay with brown and grey spotted appearance. Furthermore occur small iron oxide spots and small black spots

205-210cm : Brown coloured clay which is hardened by iron oxides

210-255cm : Brownish grey coloured clay with abundant iron oxide spots. The upper parts are characterised by a lighter brown hue and larger iron oxide spots

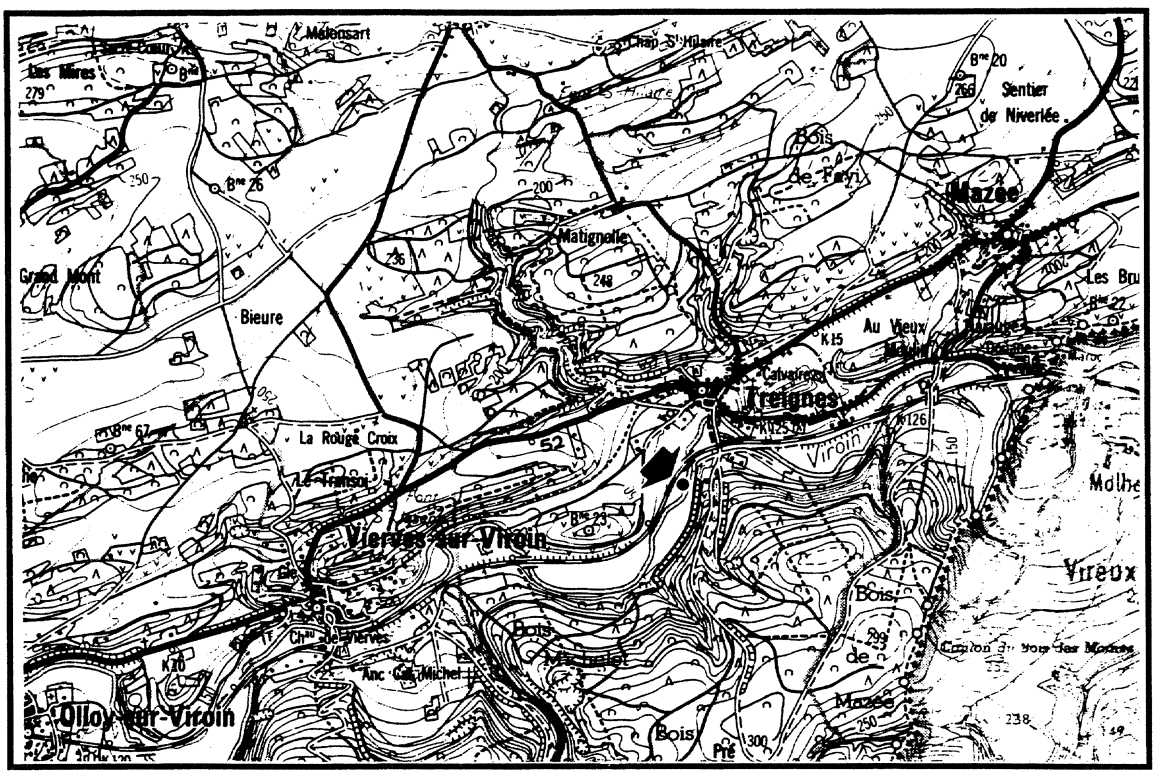
255-280cm : Marine grey coloured clay with numerous plant remains and few bivalve shells as well as small charcoal-like particles

U-sample: 20-60 cm

L-sample: 260-280 cm

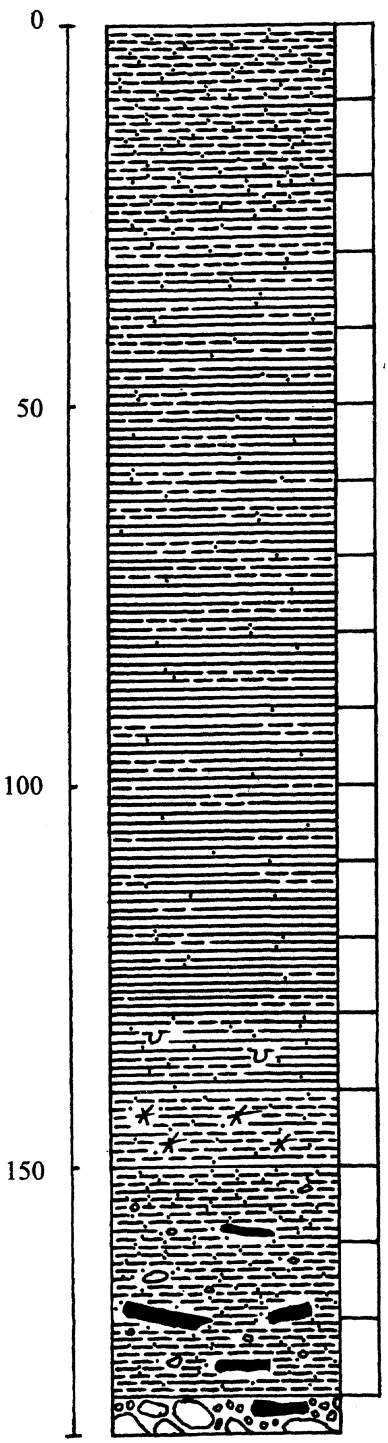
Sampling location

This sampling site is located at approximately 750 m south-west of the church of Treignes, a village situated near the French border, in the south-western part of the province of Namur.



Coordinates:	50° 05' 18''	N	Map scale:	(1:50000)
	04° 40' 05''	E	Map number:	58
Altitude:	4	m	Date:	20/06/1994

Profile description



0-130cm : Brown coloured, silty clay with little sand that gradually changes upwards into sandy silt with some dispersed clay

130-140cm : Brown coloured clay with silt and coarse grained sand. Blackened plant root traces occur

140-150cm : Rusty brown coloured, silty, sandy clay with abundant iron oxide spots

150-180cm : Grey coloured, sandy silt with some clay. Small gravel (ϕ 2-40 mm) and wood fragments occur dispersed in the deposit

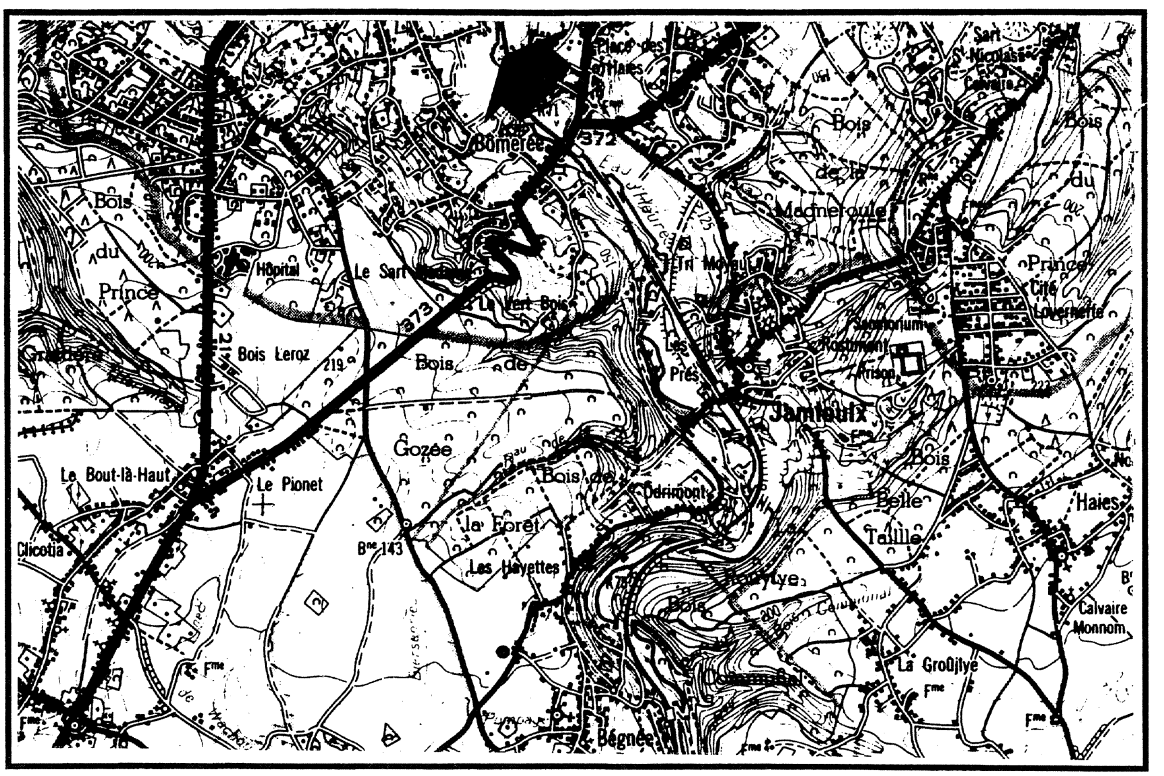
180-185cm : Grey coloured gravel-bed with pebbles and large wood fragments within a silty, sandy matrix

U-sample: 10-30 cm

L-sample: 150-170 cm

Sampling location

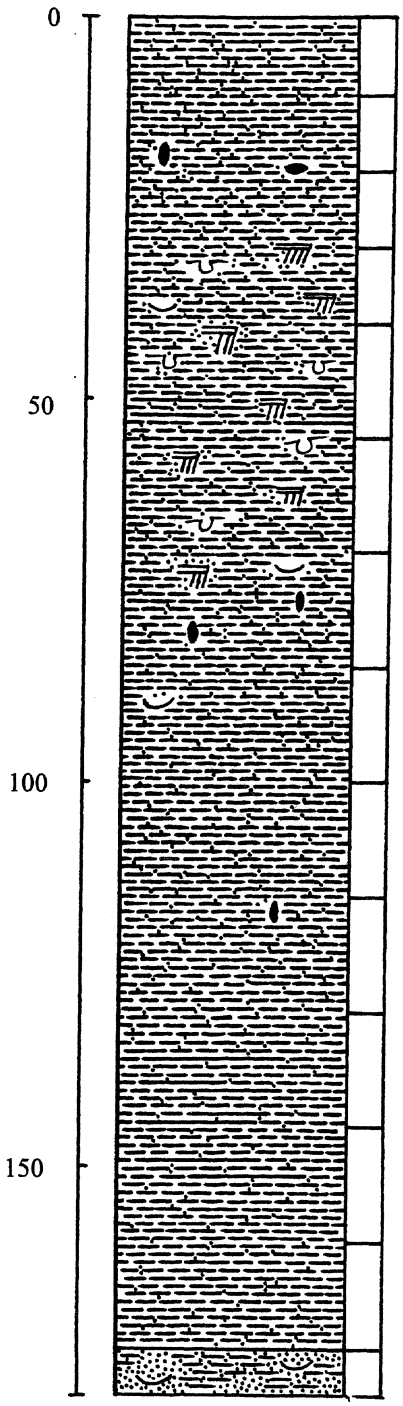
This sampling site is located at approximately 500m west of the hamlet of Place des Haies near Bômerée, a village situated at some 5km south-south-west of Charleroi in the eastern part of the province of Hainaut.



Coordinates:	50° 22' 24''	N	Map scale:	(1:50000)
	04° 23' 28''	E	Map number:	52
Altitude:	110	m	Date:	20/07/1994

Eau d'Heure **Profile 11048**

Profile description



0-174cm : Brown coloured, sandy silt with occasionally some clay. The interval is marked by remnants of oblique or cross bedding which is badly disturbed by bioturbation. Coal or charcoal fragments, molluscs and (in the upper levels) brick fragments are also occurring

174-180cm : Grey coloured, sandy layer with molluscs

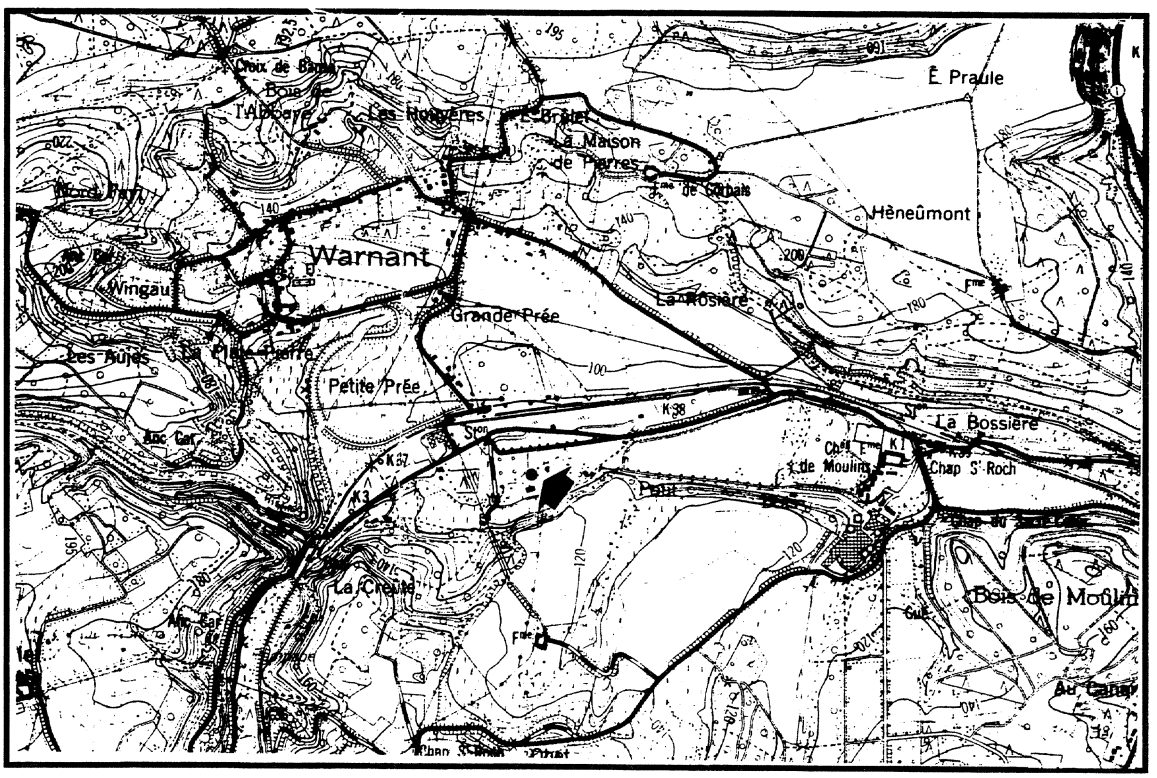
U-sample: 0-20 cm

L-sample: 150-170 cm

Molignée **Profile 11049**

Sampling location

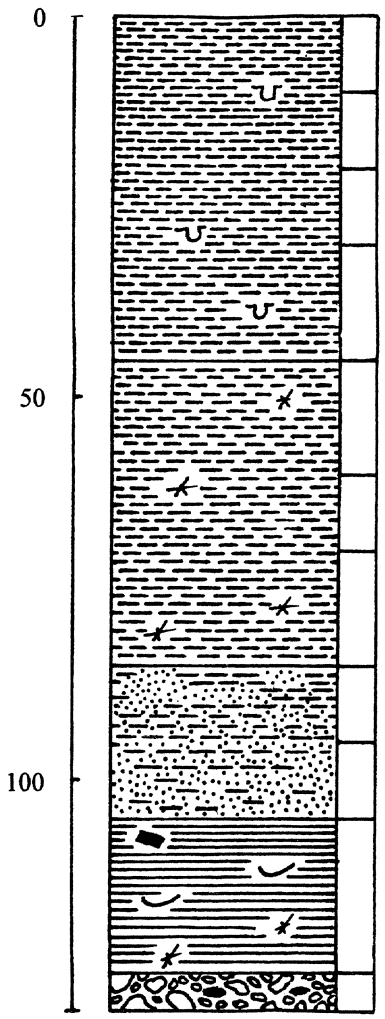
This sampling site is located approximately 1km south-east of the church of Warnant, a village situated at some 20km south of Namur.



Coordinates:	50° 19' 00''	N	Map scale:	(1:25000)
	04° 50' 35''	E	Map number:	53/3-4
Altitude:	108	m	Date:	06/07/1994

Molignée **Profile 11049**

Profile description



0-45cm : Homogeneous brown coloured silt with light grey coloured fillings of bioturbation cavities with a gradual transition to the underlying layer

45-85cm : Brownish grey coloured silt with scattered iron oxide spots and small black coloured particles ($\phi \pm 0,5$ mm). The transition to the underlying layer is gradual

85-105cm : Brownish grey coloured layer consisting of sandy silt to silty, fine grained sand with small black coloured particles ($\phi \pm 0,125$ mm to ± 1 mm)

105-125cm : Brown to rusty (at the bottom) coloured clay with gastropods, bivalves, wood fragments and some black coloured particles ((char-) coal, slags or 'Marbre Noir'?)

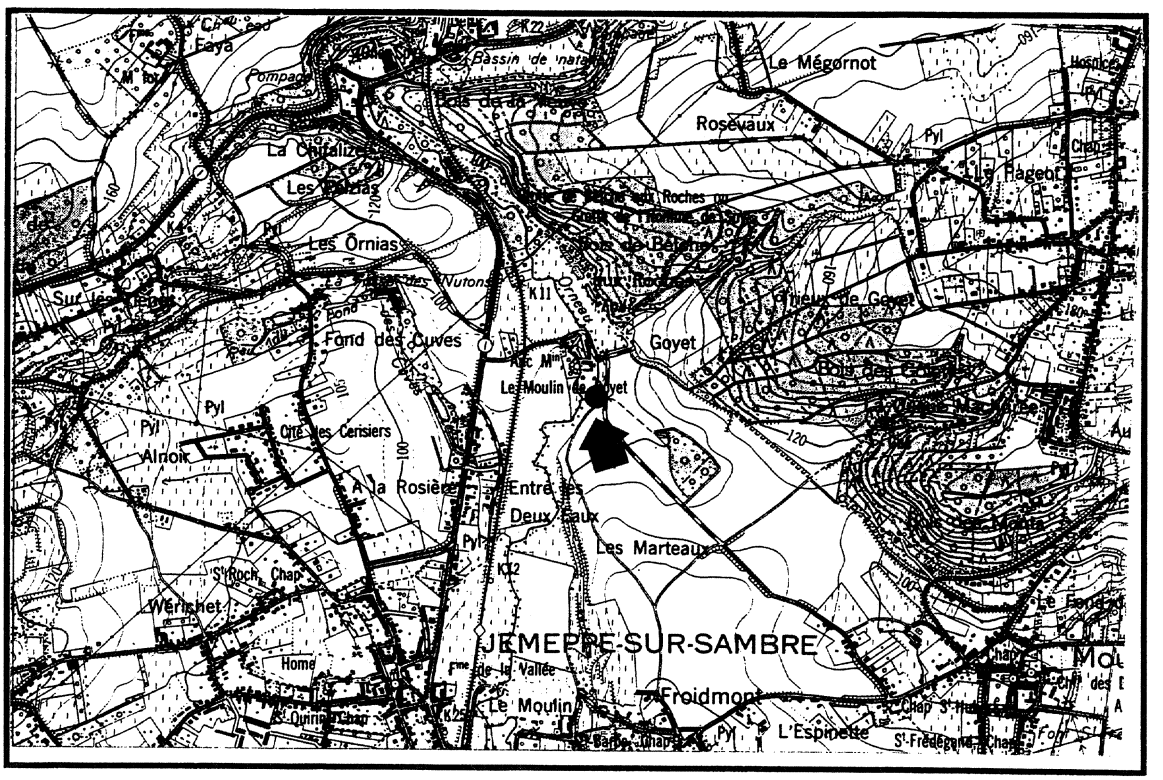
125-130cm : Water-bearing gravel bed containing both blue (and/or green) coloured, glassy slags and grey coloured, weathered slags in a matrix of coarse grained sand

U-sample: 10-30 cm

L-sample: 105-125 cm

Sampling location

This sampling site is located approximately 1km north-west of the church of Jemeppe-sur-Sambre, a village situated at some 10km south-south-west of Gembloux in the northern part of the province of Namur.

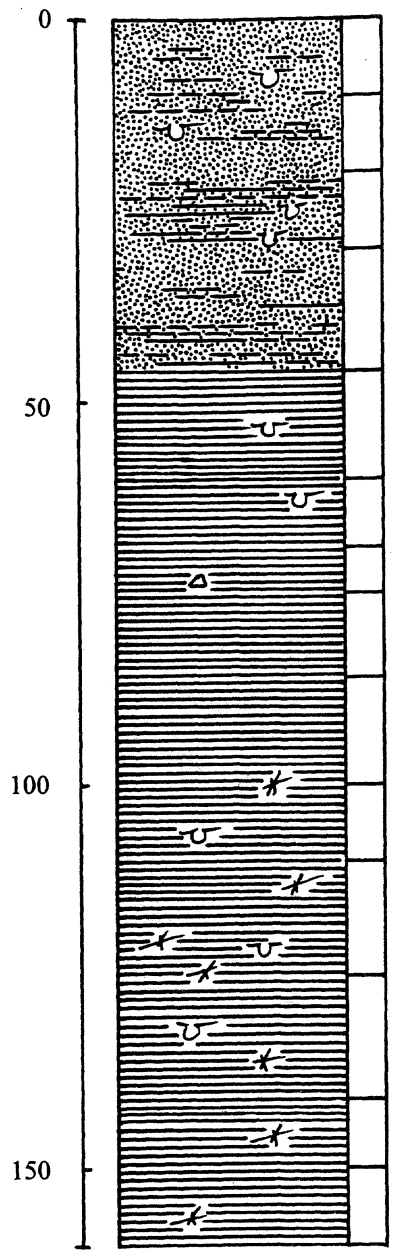


Coordinates:	50° 28' 32''	N	Map scale:	(1:25000)
	04° 40' 40''	E	Map number:	47/1-2
Altitude:	100	m	Date:	15/07/1994

Orneau

Profile 11050

Profile description



0-46cm : Brown coloured silty sand with some clay and intense bioturbation which severely disturbs the original (oblique or cross ?) bedding

46-141cm : Brown to brownish grey (at the bottom) coloured clay with intense bioturbation both at the top and at the bottom. The lower parts of the bed are marked by numerous iron oxide spots

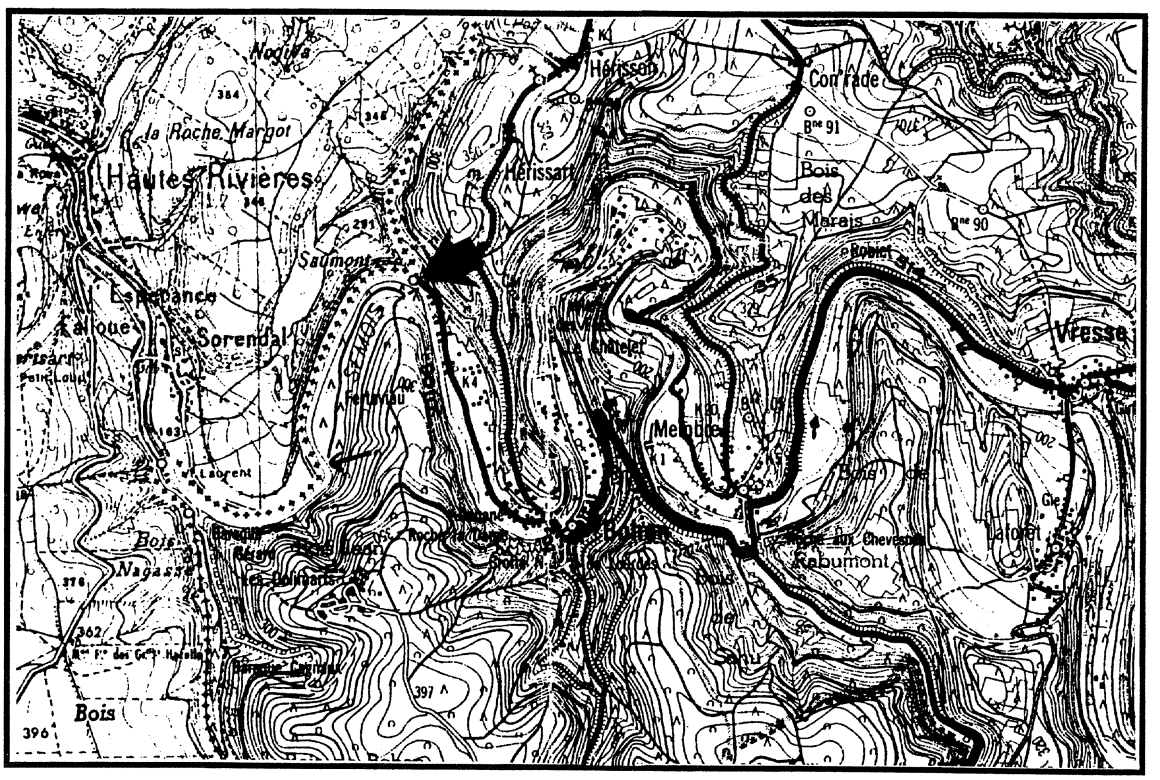
141-160cm : Light marine grey coloured clay with iron oxide spots

U-sample: 5-25 cm

L-sample: 120-140 cm

Sampling location

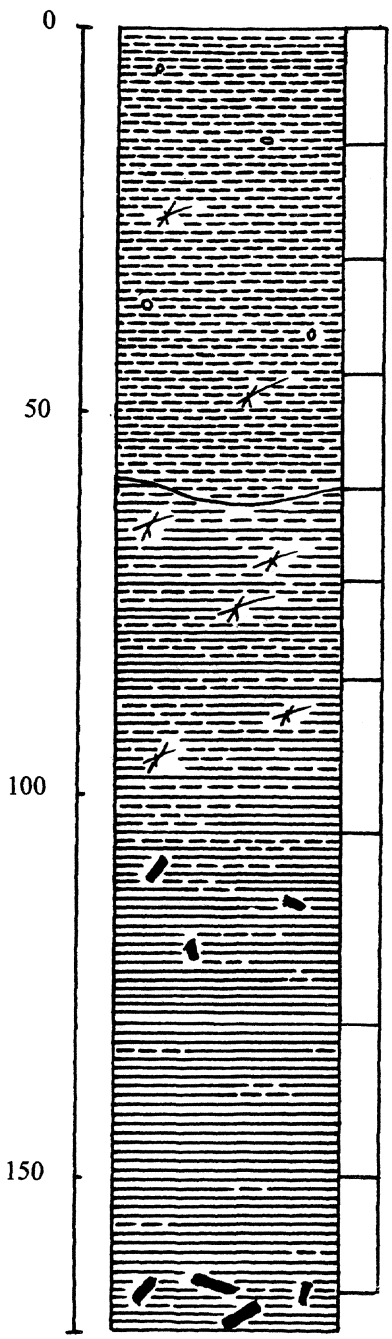
This sampling site is located at approximately 2km north-north-west of the church of Bohan, a village situated in the most southern part of the province of Namur, near the French border, some 20km north-west of Bouillon.



Coordinates:	49° 52' 47''	N	Map scale:	(1:50000)
	04° 52' 22''	E	Map number:	63
Altitude:	165	m	Date:	12/08/1994

Semois **Profile 11051**

Profile description



0-60cm : Brown coloured silt with some scattered gravel (ϕ 1cm) and Fe-oxide spots

60-105cm : Grey coloured layer consisting of clay-rich silt or silty clay with Fe-oxide spots. The upper contact is irregular

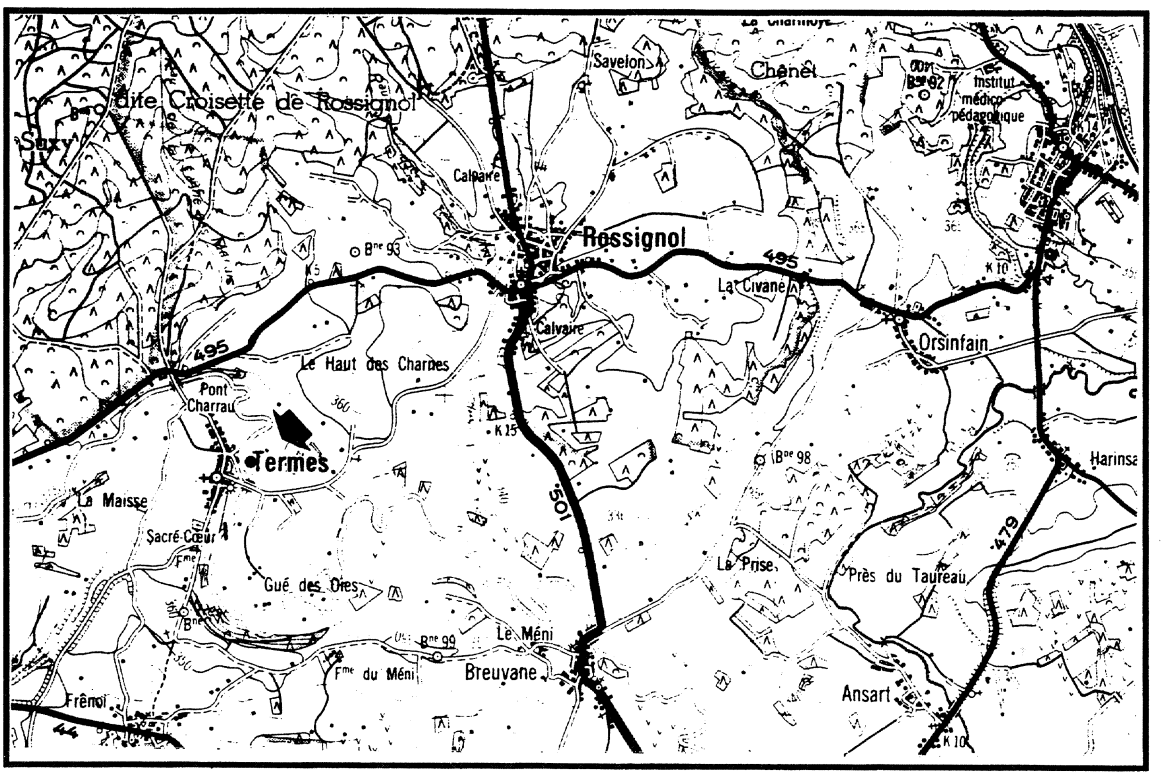
105-170cm : Bluish grey coloured, silty clay. The silt content increases upwards. Near the bottom, a sub-recent accumulation of wood-fragments and leafs occur

U-sample: 5-30 cm

L-sample: 120-150 cm

Sampling location

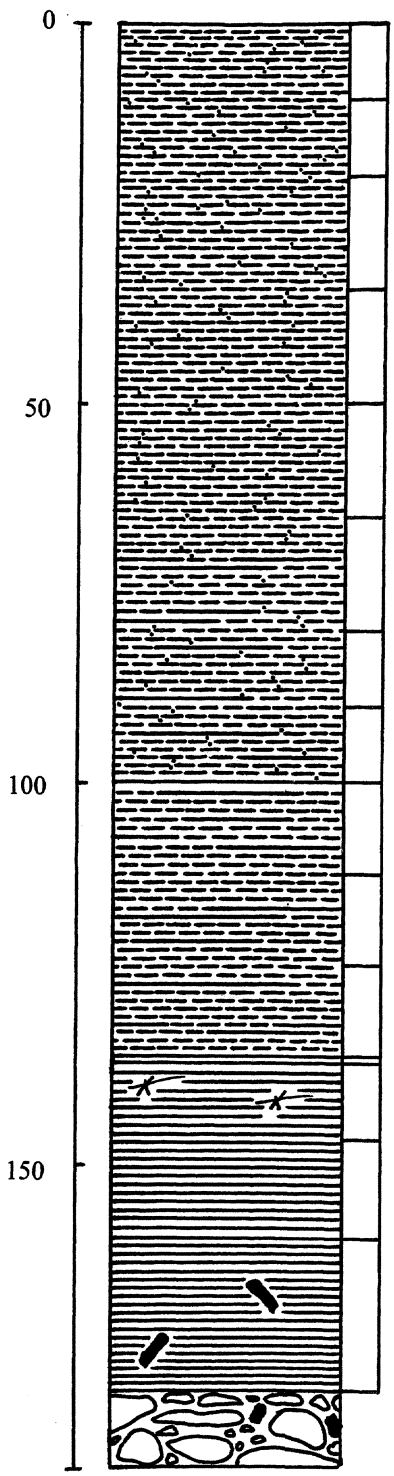
This sampling site is located at approximately 250m north-east of the church of Termes, a village situated in the southern part of the province of Luxembourg, at some 30km west of Arlon.



Coordinates:	49° 42' 30''	N	Map scale:	(1:50000)
	05° 27' 35''	E	Map number:	68
Altitude:	340	m	Date:	27/07/1994

Semois **Profile 11052**

Profile description



0-100cm : Light brown coloured, mainly sandy silt with some clay at the bottom. Without visible lamination

100-136cm : Extensively spotted, brown and grey coloured sandy silt with clay

136-137cm : Fe-oxide layer

137-160cm : Light grey coloured clay with Fe-oxide spots near the top

160-180cm : Dark grey coloured clay with wood fragments and vivianite

160-180cm : Gravel layer with wood fragments occurring within a grey coloured clay matrix

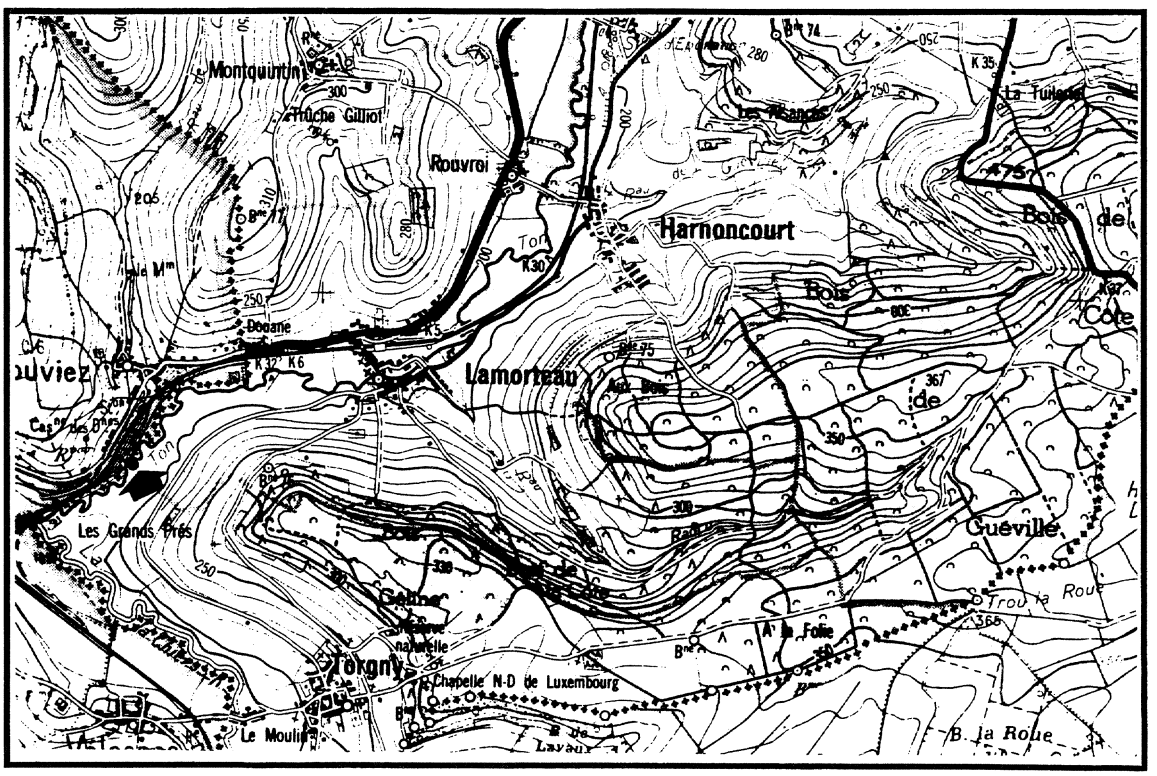
U-sample: 0-20 cm

L-sample: 160-180 cm

Ton **Profile 11053**

Sampling location

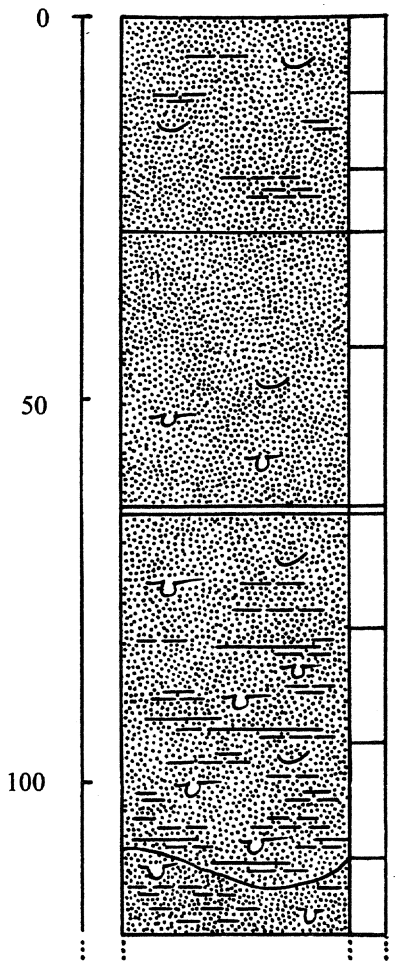
This sampling site is located at approximately 1.8km west-south-west of the church of Lamorteau, a village situated near the French border in the most southern part of the province of Luxembourg, at some 7.5km south-west of Virton.



Coordinates:	49° 31' 24''	N	Map scale:	(1:50000)
	05° 27' 30''	E	Map number:	71
Altitude:	190	m	Date:	10/08/1994

Ton **Profile 11053**

Profile description



0-28cm : Brown coloured, silty, sand with some small gastropods

28-64cm : Brown coloured sand with some small gastropods and strong bioturbation

64-65cm : Rusty to brown coloured sand with Fe-oxide precipitation

65-110cm : Brown coloured, silty, fine grained sand with some gastropods and bioturbation and occasionally some clay. At 95 cm depth occurs a thin, dark grey coloured layer. The lower contact with the underlying transition zone is irregular

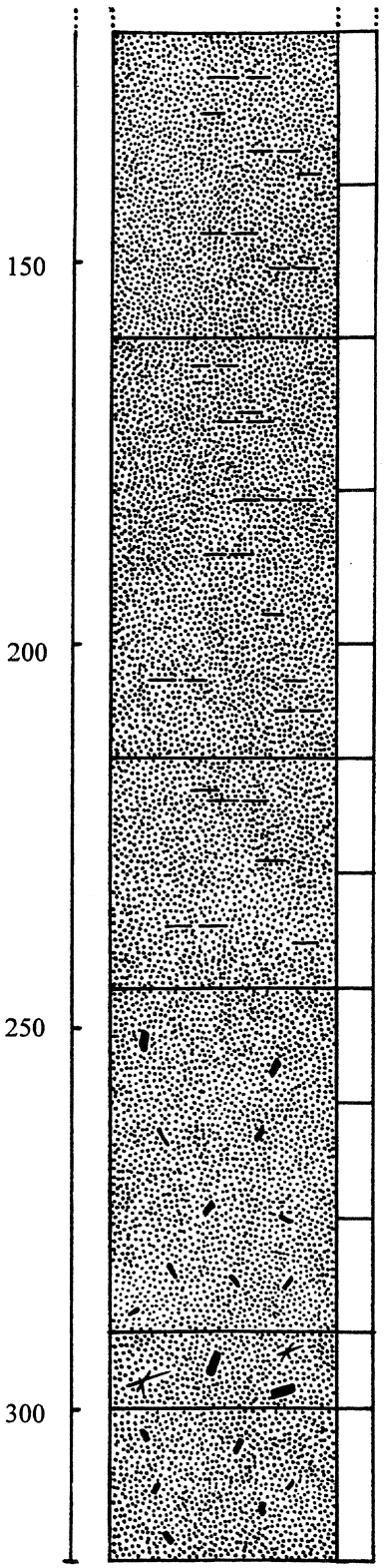
110-120cm : Brown to ochre coloured transition zone between two deposits with some bioturbation

U-sample: 0-20 cm

L-sample: 300-320 cm

Ton **Profile 11053**

Profile description (bis)



120-160cm : Ochreous yellow coloured sand with vague lamination caused by the presence of silty sand and/or humus-rich sand

160-215cm : Ochreous yellow coloured sand with clear lamination caused by the presence of silty sand and/or humus-rich sand

215-245cm : Ochreous yellow coloured sand

245-290cm : Ochreous yellow coloured, medium grained sand

290-300cm : Grey coloured sand with organic material and unconsolidated Fe-oxide spots

300-320 : Brownish grey coloured sand with organic material

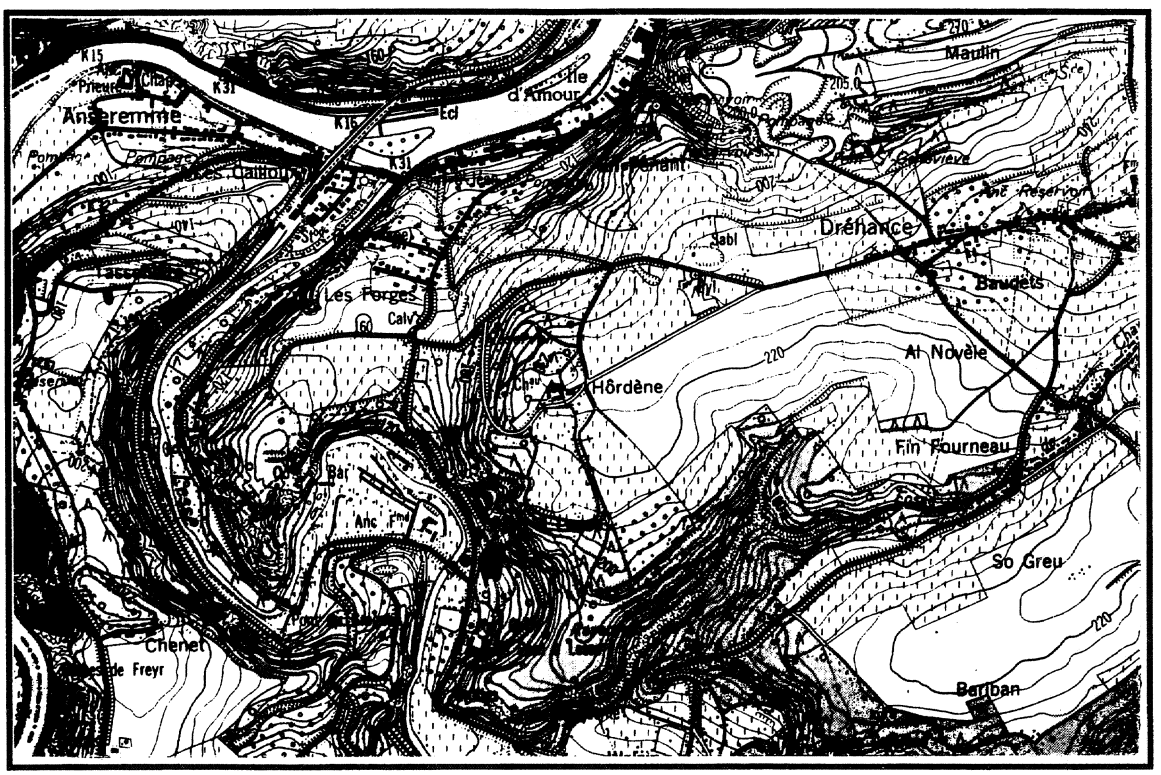
U-sample: 0-20 cm

L-sample: 300-320 cm

Lesse **Profile 11054**

Sampling location

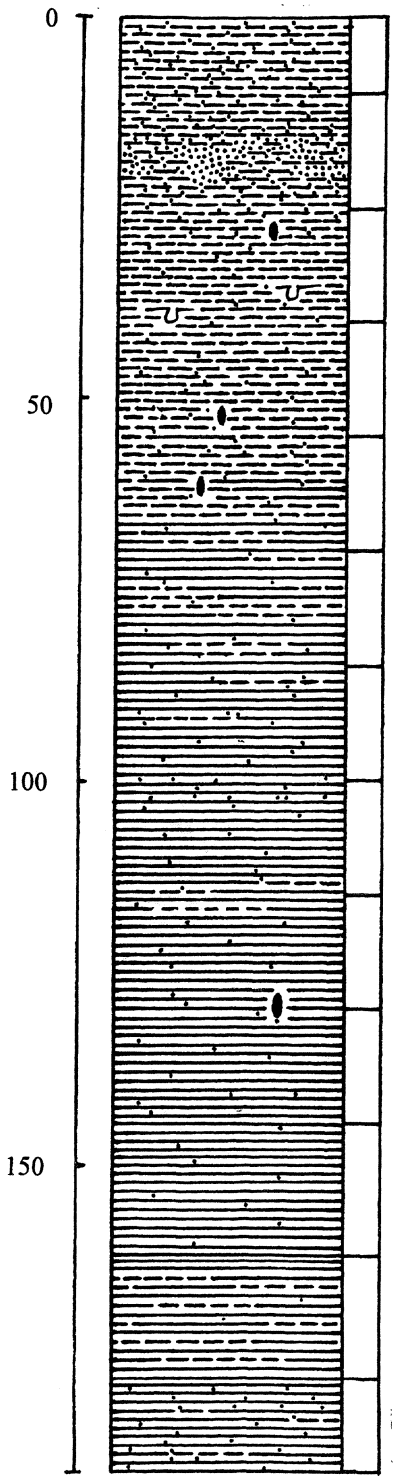
This sampling site is located about 50 m downstream of the Pont à l'Anse Bridge, south of Anseremme. Anseremme is a village laying some 3km south of Dinant in the province of Namur.



Coordinates:	50° 13' 44''	N	Map scale:	(1:25000)
	04° 54' 45''	E	Map number:	53/7-8
Altitude:	98	m	Date:	07/07/1994

Lesse **Profile 11054**

Profile description



0-162cm : C.U. seq. with brown coloured clay at the bottom and brown coloured sandy silt with small charcoal fragments near the top

162-178cm : grey coloured sandy to silty clay

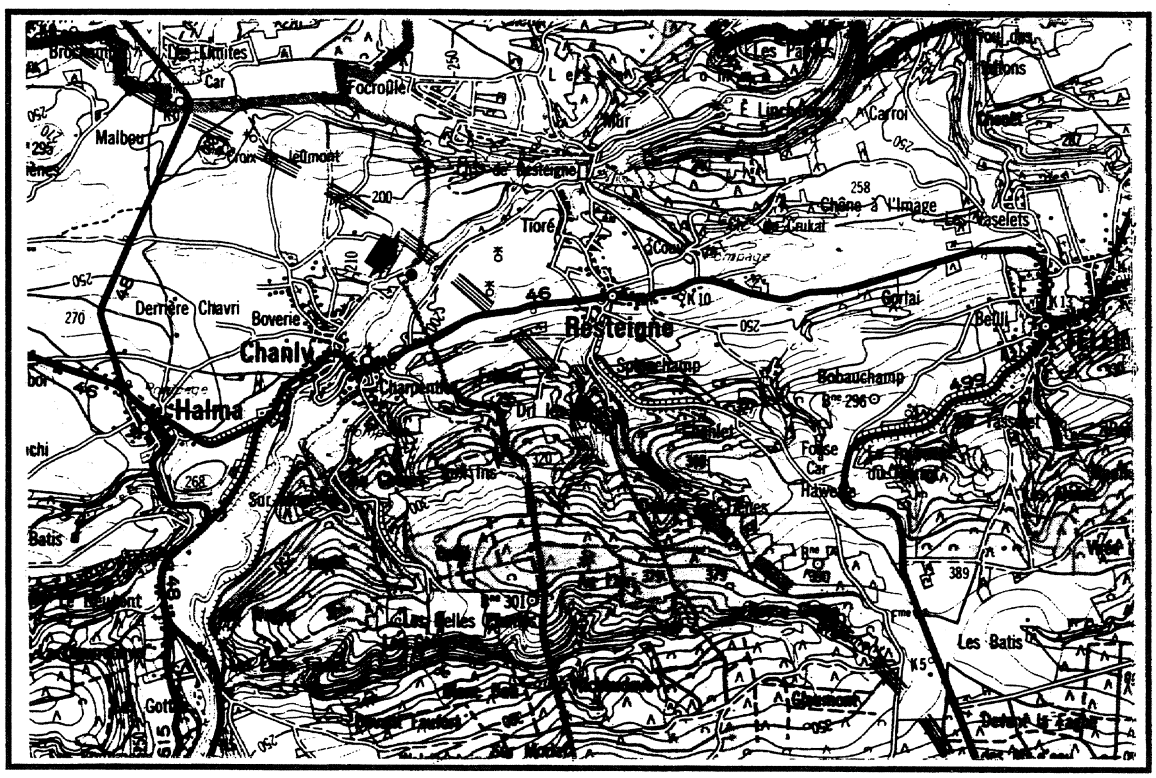
178-190cm : rusty coloured sandy to silty clay

U-sample: 0-20 cm

L-sample: 162-190 cm

Sampling location

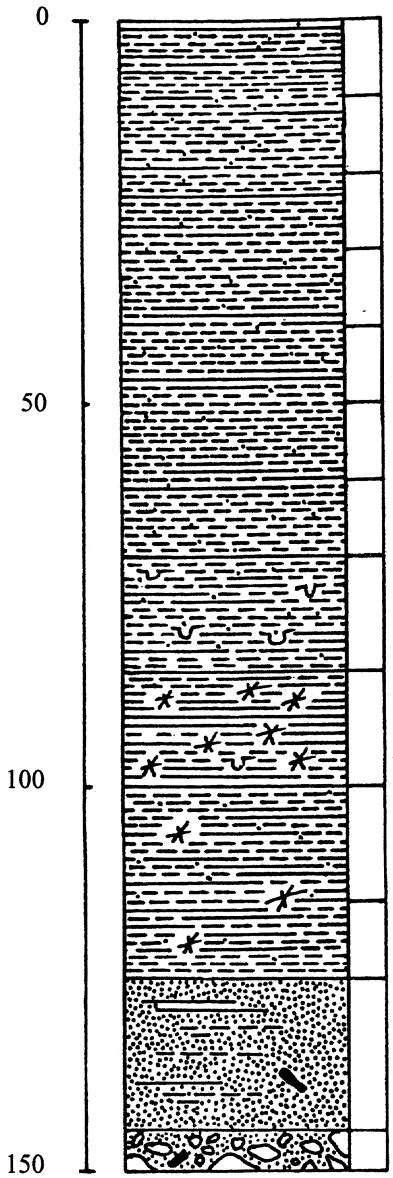
This sampling site is located at approximately 700m north-east of the church of Chanly, 50m upstream from the E411 highway bridge over the Lesse. Chanly is a village laying in the eastern part of the province of Namur, near Han-sur-Lesse, some 25km south-east of Dinant.



Coordinates:	50° 05' 15''	N	Map scale:	(1:50000)
	05° 09' 50''	E	Map number:	59
Altitude:	185	m	Date:	15/06/1994

Lesse **Profile 11055**

Profile description



0-71cm : Brown coloured, clay-rich silt with some sand

71-81cm : Grey coloured, clay-rich silt with some sand and small, black root traces

81-102cm : Grey to rusty brown coloured, silty clay with abundant Fe-oxide spots & black root traces

102-127cm : Grey coloured sandy clay with some Fe-oxide spots. Water seepage

127-145cm : Coarse, brownish grey coloured sand with some silt and clay as well as plant debris. Water seepage

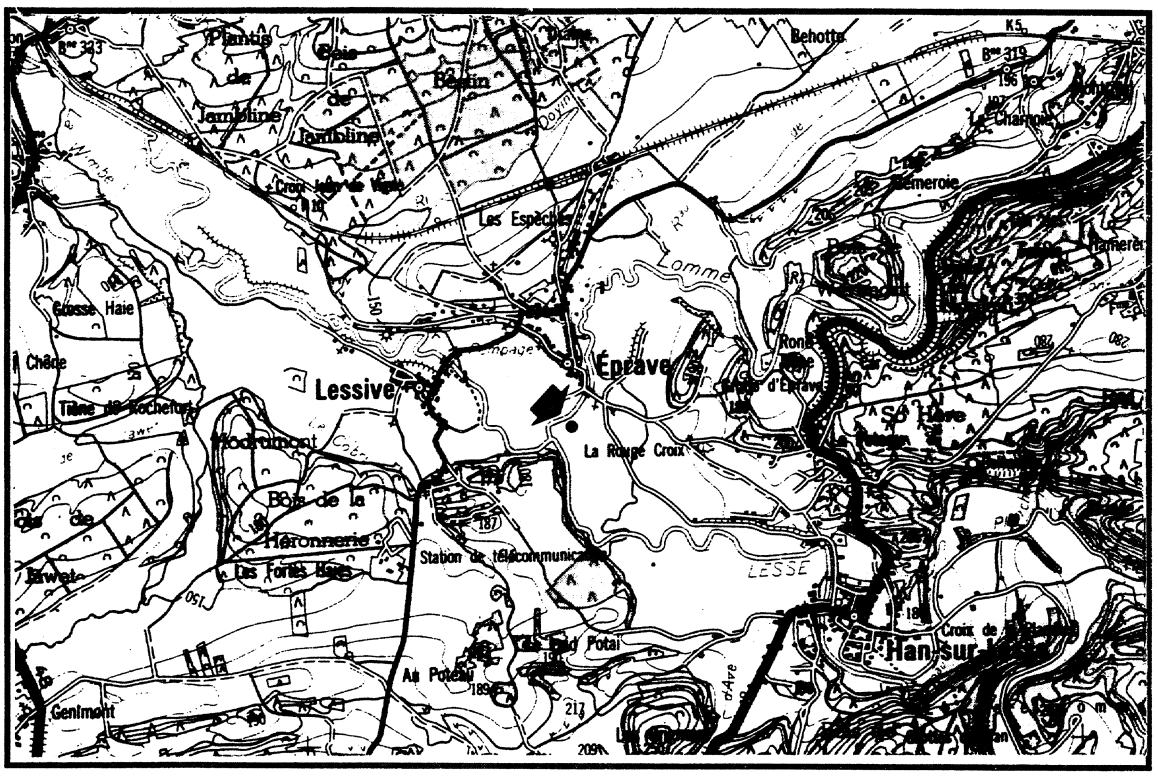
145-150cm : Layer of coarse sand, gravel, boulders and wood fragments. Water seepage

U-sample:	10-30	cm
L-sample:	100-125	cm

Lomme **Profile 11056**

Sampling location

This sampling site is located 100m downstream from the bridge over the Lomme in Eprave. Eprave is a village laying in the eastern part of the province of Namur, near Han-sur-Lesse, some 25km south-east of Dinant.

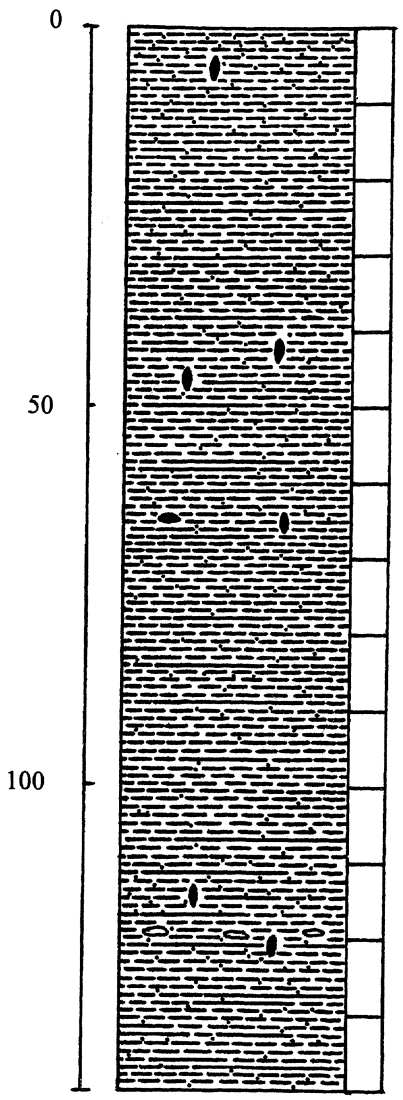


Coordinates:	50° 08' 19''	N	Map scale:	(1:50000)
	05° 09' 50''	E	Map number:	59
Altitude:	155	m	Date:	12/07/1994

Lomme

Profile 11056

Profile description



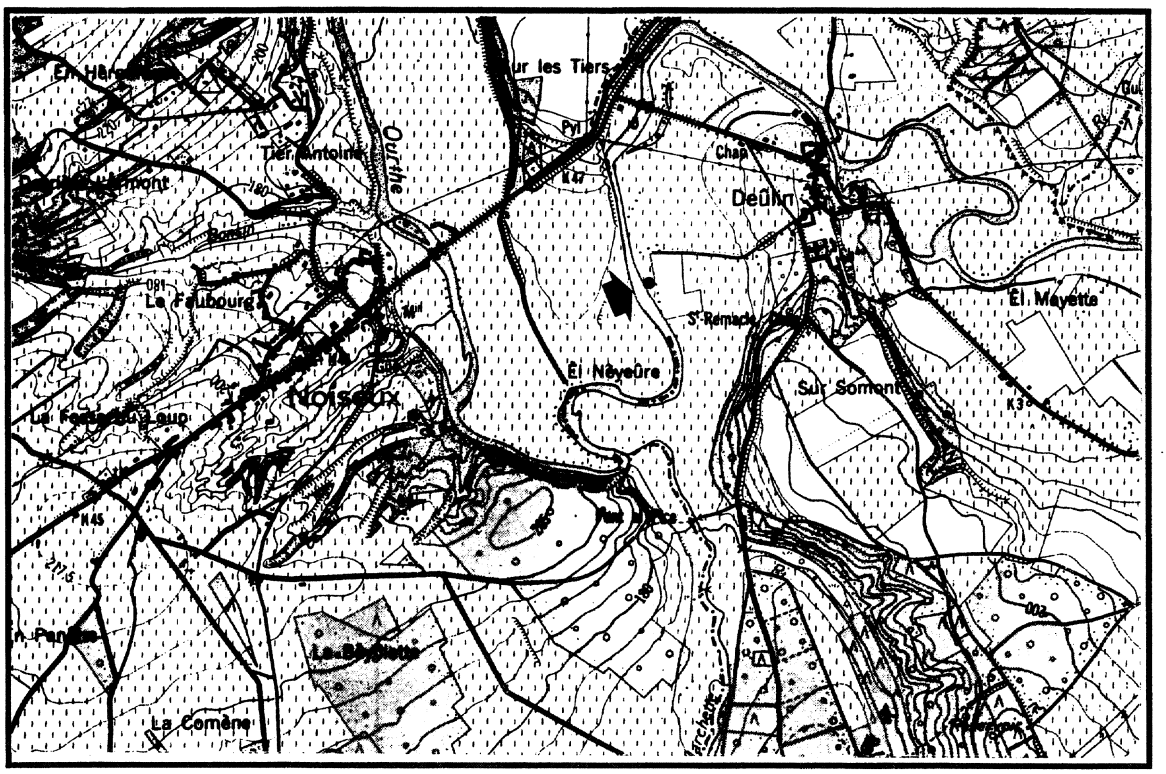
0-140cm : Brown coloured sandy silt with some clay. There are small variations in the proportions of sand and clay and in the granulometry of the sand. Charcoal fragments occur all over the profile. At ± 120cm depth, some small, well-rounded and flattened gravel (ϕ 2cm) occurs

U-sample: 0-20 cm

L-sample: 120-140 cm

Sampling location

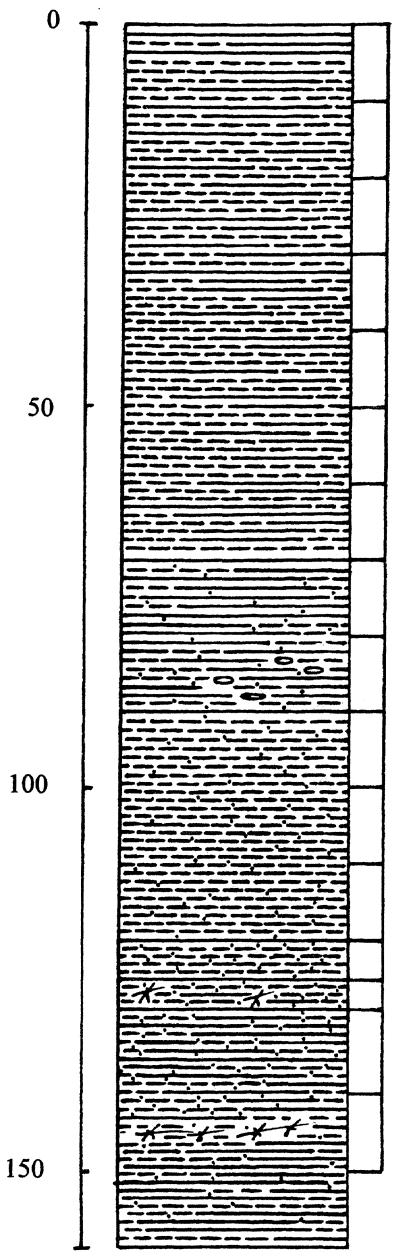
This sampling site is located at approximately 600m west of the St.-Remacle chapel of Deûlin, a village laying in the eastern part of the province of Namur, some 8km south-west of Durbuy.



Coordinates:	50° 18' 19''	N	Map scale:	(1:25000)
	05° 23' 27''	E	Map number:	53/3-4
Altitude:	160	m	Date:	23/06/1994

Ourthe **Profile 11057**

Profile description



0-70cm : Brown coloured silty clay or clay-rich silt. At the top, black plastic occurs

70-90cm : Brown coloured silty clay with some sand and small amounts of gravel

90-120cm : Brown coloured sandy silt with small black spots

120-125cm : Grey coloured sandy silt

125-129cm : Mainly rusty coloured sandy silt with some clay

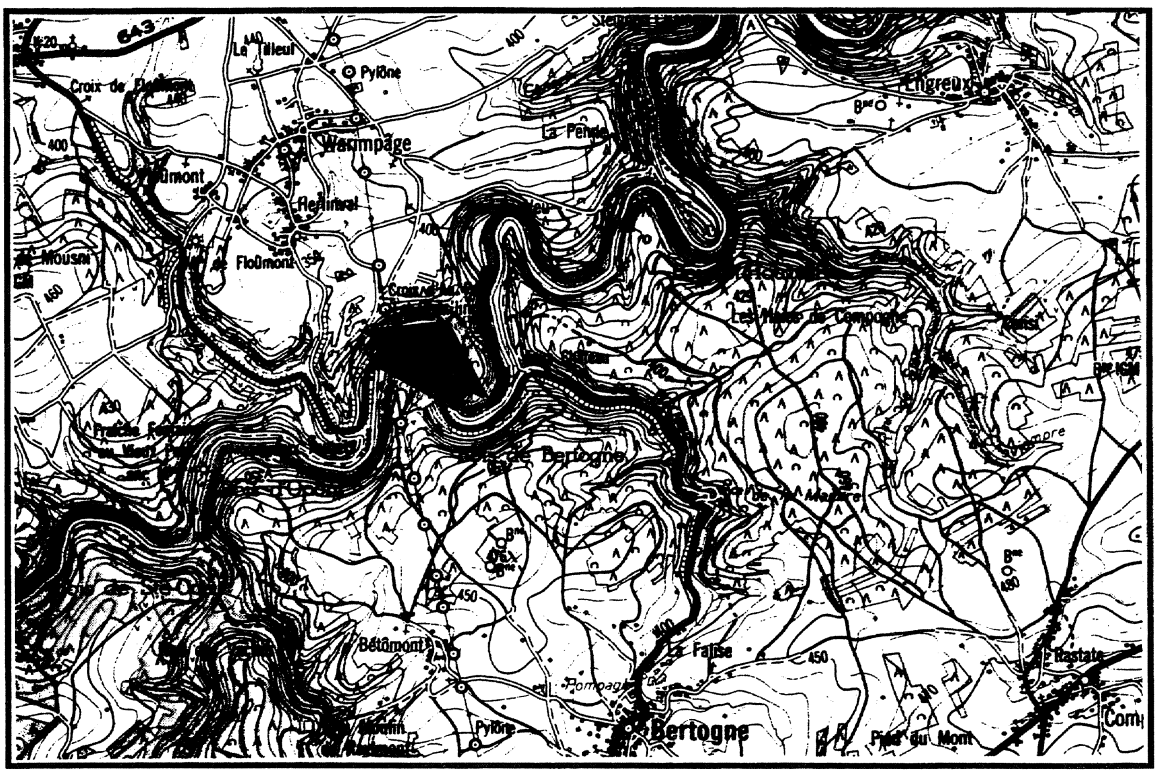
129-160cm : Grey coloured silty to sandy clay

U-sample: 10-40 cm

L-sample: 129-145 cm

Sampling location

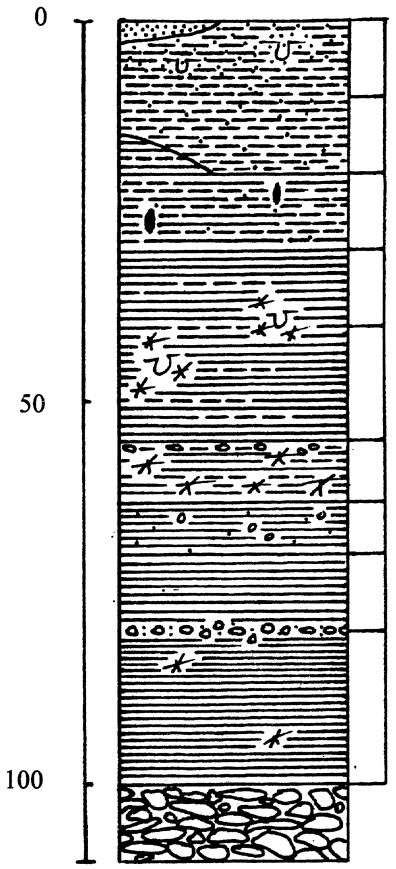
This sampling site is located at approximately 1,5km south-east of the church of Warempange, a village laying at some 12km west-south-west of Houffalize, in the eastern part of the province of Luxembourg.



Coordinates:	50° 06' 29''	N	Map scale:	(1:50000)
	05° 39' 40''	E	Map number:	60
Altitude:	296	m	Date:	05/07/1994

Ourthe Occidentale — Profile 11058

Profile description



0-20cm : Brown coloured sandy silt with the sand fraction increasing toward the top. Vague bioturbations filled with the overlying sand

20-30cm : Light brownish grey coloured silty clay with some fine sand and fine charcoal fragments

30-55cm : Dark brownish grey coloured silty clay to clay with Fe-oxide spots along roots

55-63cm : Brown to rusty coloured silty clay and sandy clay. At the top of the horizon a fine gravelbed appears in a clay matrix.
63-70cm : Grey to greyish brown coloured clay with sand and fine gravel

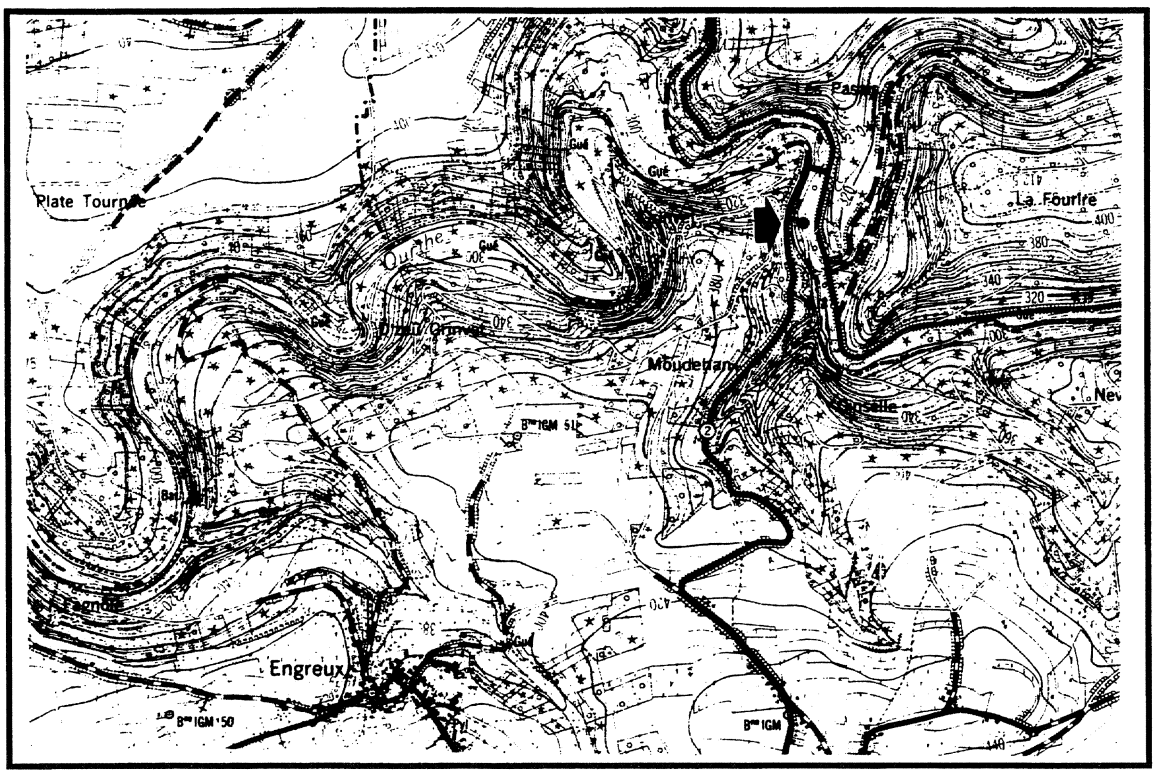
70-100cm : Irregular horizon of fine grey coloured silty clay, with a few Fe-oxide spots in the lower part of the horizon. At 80 cm depth, a thin layer of fine, angular gravel (dark quartzite) in a grey clay matrix occurs

100-110cm : A strongly water-bearing gravelbed appears in a grey coloured fine granular matrix

U-sample:	0-20	cm
L-sample:	80-100	cm

Sampling location

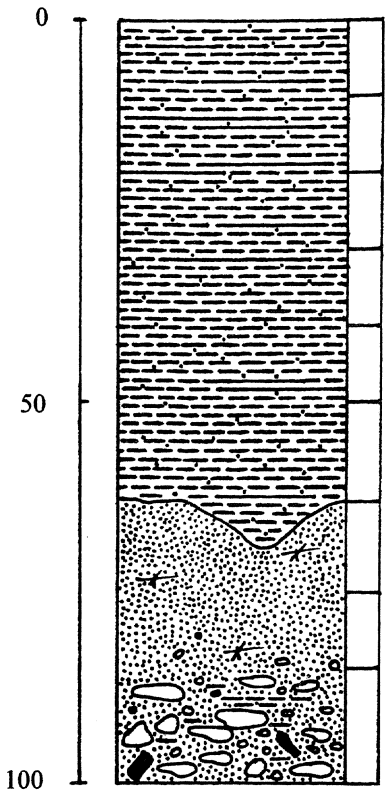
This sampling site is located at approximately 2km north-west of the church of Engreux, a village situated at some 7km west of Houffalize, in the eastern part of the province of Luxembourg.



Coordinates:	50° 08' 06''	N	Map scale:	(1:25000)
	05° 43' 27''	E	Map number:	60/3-4
Altitude:	300	m	Date:	05/07/1994

Ourthe Orientale — Profile 11059

Profile description



0-63cm : Brown coloured sandy silt, partially with some clay

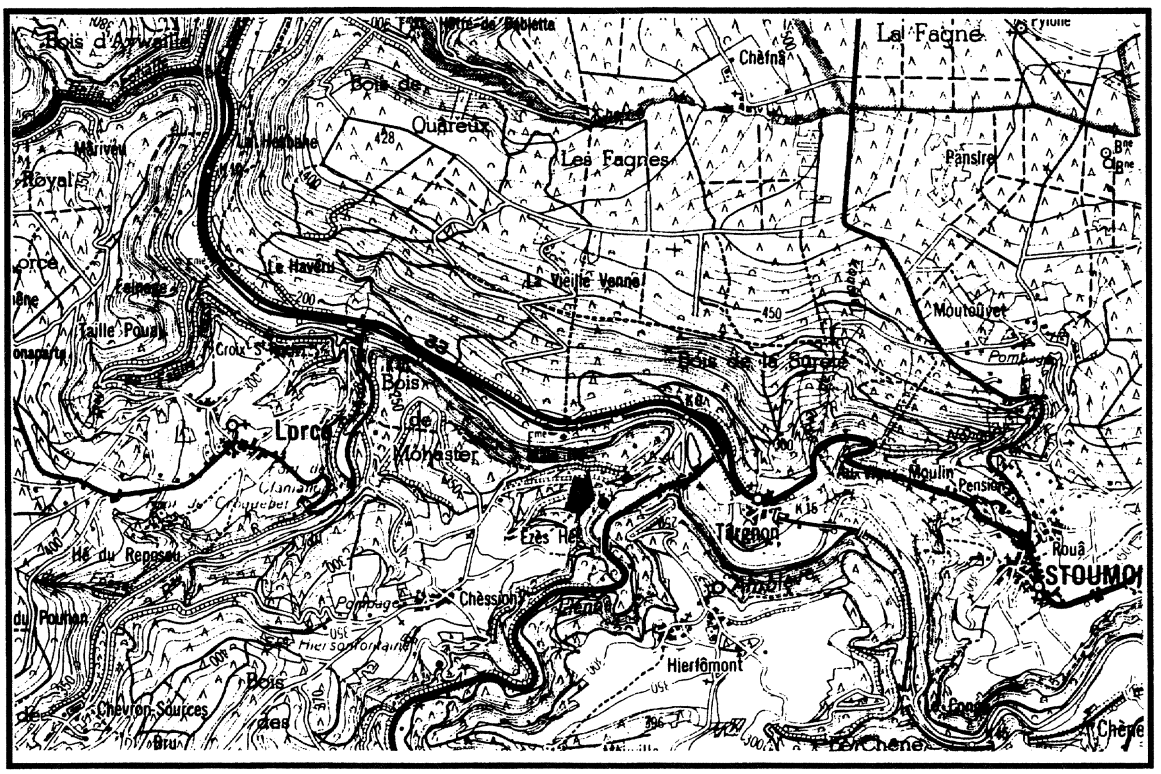
63-100cm : F.U.-seq., grey coloured, with in the lower part a coarse gravel bed within a matrix of fine gravel and coarse grained silty sand; in the upper part coarse grained sand with Fe-oxide spots. In the gravel bed, brown silty clay spots occur which contain wood fibers

U-sample: 0-20 cm

L-sample: 63-85 cm

Sampling location

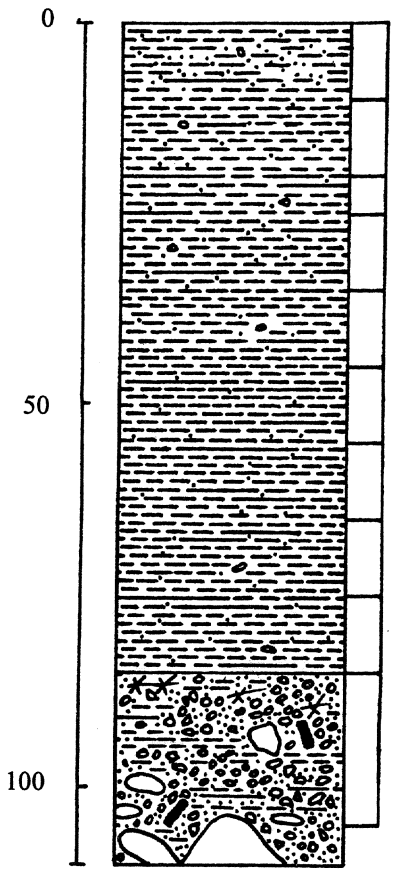
This sampling site is located at approximately 1km due west of the church of Targnon, a village situated at the intersection of the Lienne and the Amblève, some 30km south-east of Liège.



Coordinates:	50° 24' 32''	N	Map scale:	(1:50000)
	05° 46' 12''	E	Map number:	49
Altitude:	220	m	Date:	16/08/1994

Lienne **Profile 11060**

Profile description



0-65cm : Humus-rich, brown coloured, clayey, sandy silt with little, fine, black and red coloured gravel (ϕ 2-6 mm), without visible sedimentation structures

65-85cm : Brownish grey coloured sandy, clayey silt with fine, black and red coloured gravel

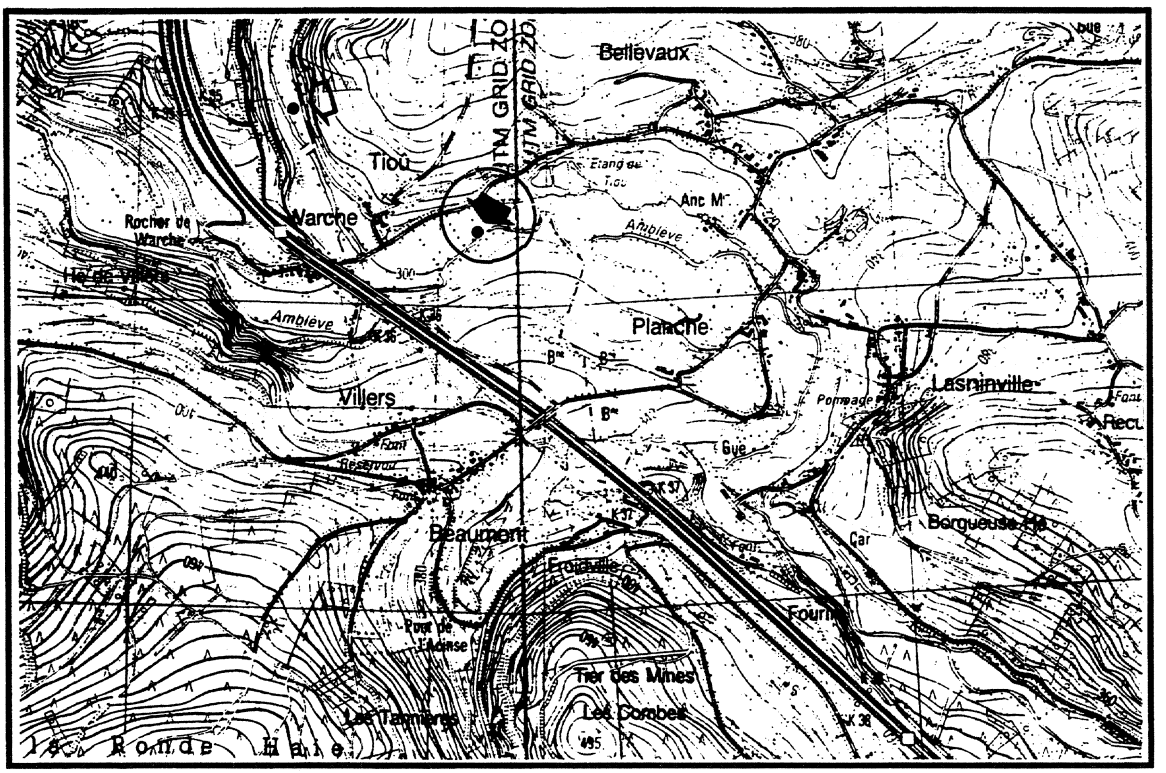
85-105cm : Grey coloured, sandy, clayey silt, badly sorted, with brownish grey coloured spots of fine gravel and sand. The gravel is water-bearing. Little charcoal fragments and big boulders appear at the base of the profile

U-sample: 0-20 cm

L-sample: 85-105 cm

Sampling location

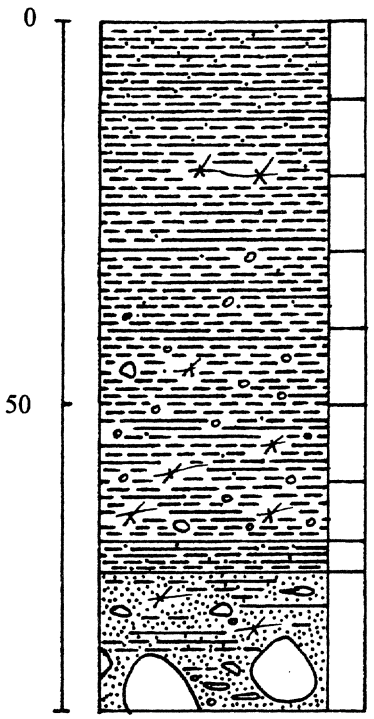
This sampling site is located at approximately 800m north of the chapel of Beaumont, 250m upstream of the intersection of the Warche and the Amblève. Beaumont is situated at some 5km east of Stavelot, in the south-eastern part of the province of Liège.



Coordinates:	50° 23' 16''	N	Map scale:	(1:25000)
	05° 59' 53''	E	Map number:	50/5-6
Altitude:	300	m	Date:	22/09/1994

Amblève **Profile 11061**

Profile description



0-20cm : Brown coloured, humus-rich, sandy, silty clay, which converts gradually into the underlying horizon

20-68cm : Light greyish brown coloured, silty clay with gravel appearing dispersed in the deposit. The gravel is badly rounded at the bottom of the layer and well rounded (not spherical) more upwards

68-72cm : Complete rusty layer of silty clay (or clayey silt) with a little sand

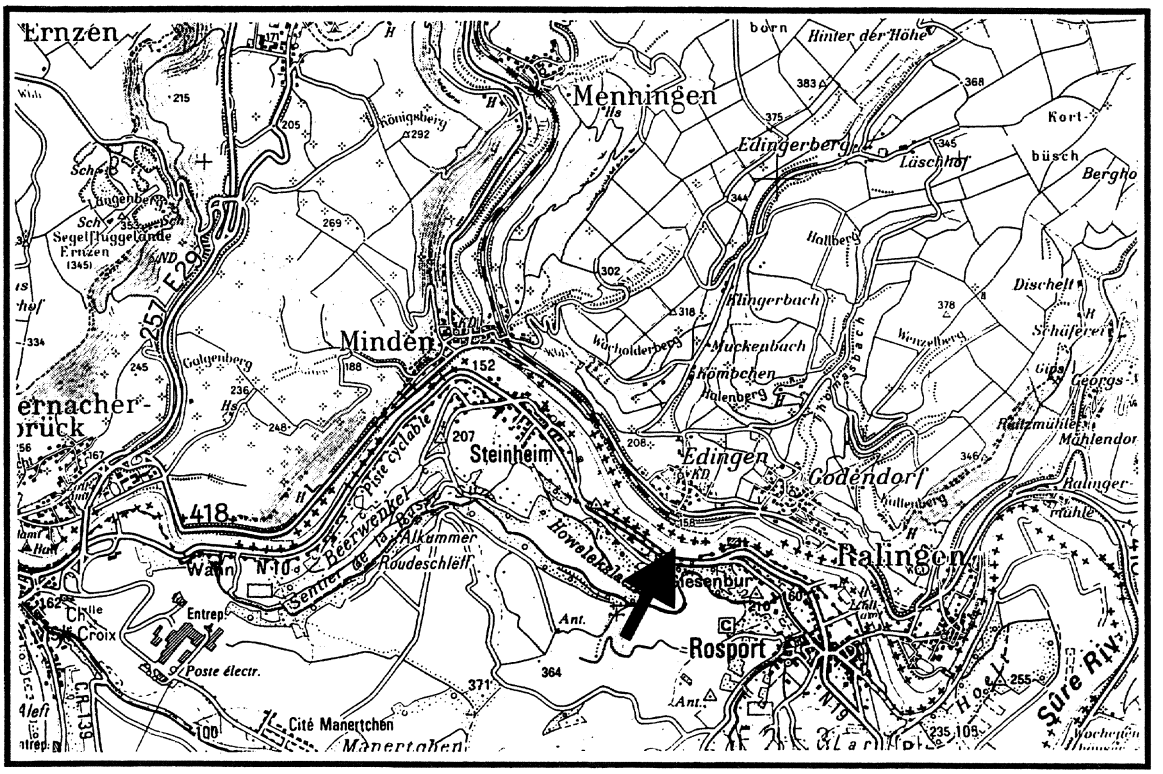
72-90cm : Layer of boulders in a dark, grey matrix of clayey, silty sand with root fragments

U-sample: 0-20 cm

L-sample: 50-68 cm

Sampling location

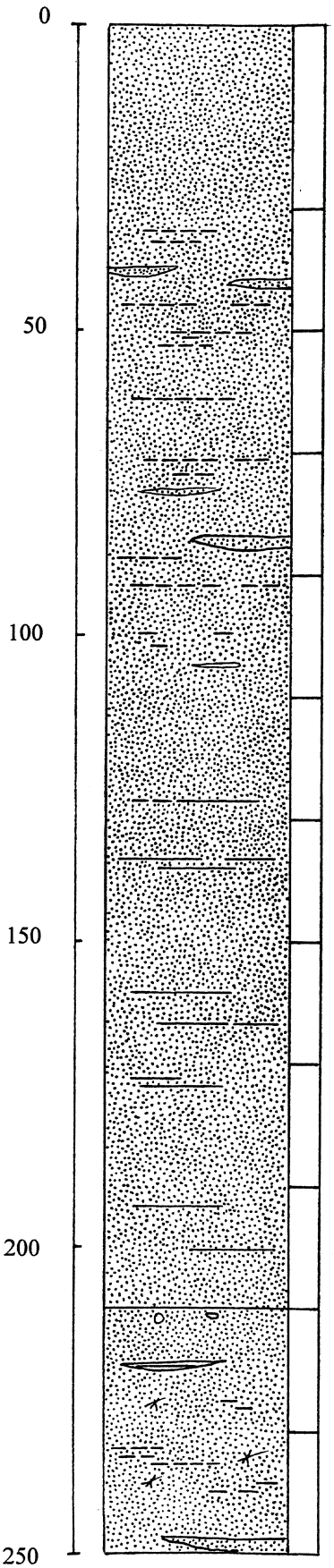
This sampling site is located at approximately 1km north-west of the church of Rosport. Rosport is a village situated at the most eastern part of the Grand-Duchy of Luxembourg, along the German border.



Coordinates:	49° 48' 06''	N	Map scale:	(1:50000)
	06° 29' 41''	E	Map:	Luxembourg Nord
Altitude:	158	m	Date:	11/10/1994

Sûre **Profile 11062**

Profile description



0-30cm : Root zone with medium grained sand

30-210cm : Practically homogeneous medium grained sand, more or less silty, getting finer and more silty and clayey downward. A few spots of beige coloured sand appear, which get fewer and smaller with depth and eventually disappear at 110 cm depth

210-250cm : Irregular, red-brown layer consisting of fine to silty sand. At 212 cm depth a few pebbles (ϕ 12 mm) of white quartz occur. Little black-brown spots appear between 210 and 240 cm and a few small, indistinct Fe-oxide spots form at 235 cm depth. At 220 cm depth, there is a homogeneous, compact, yellowish beige coloured, silty clay lens

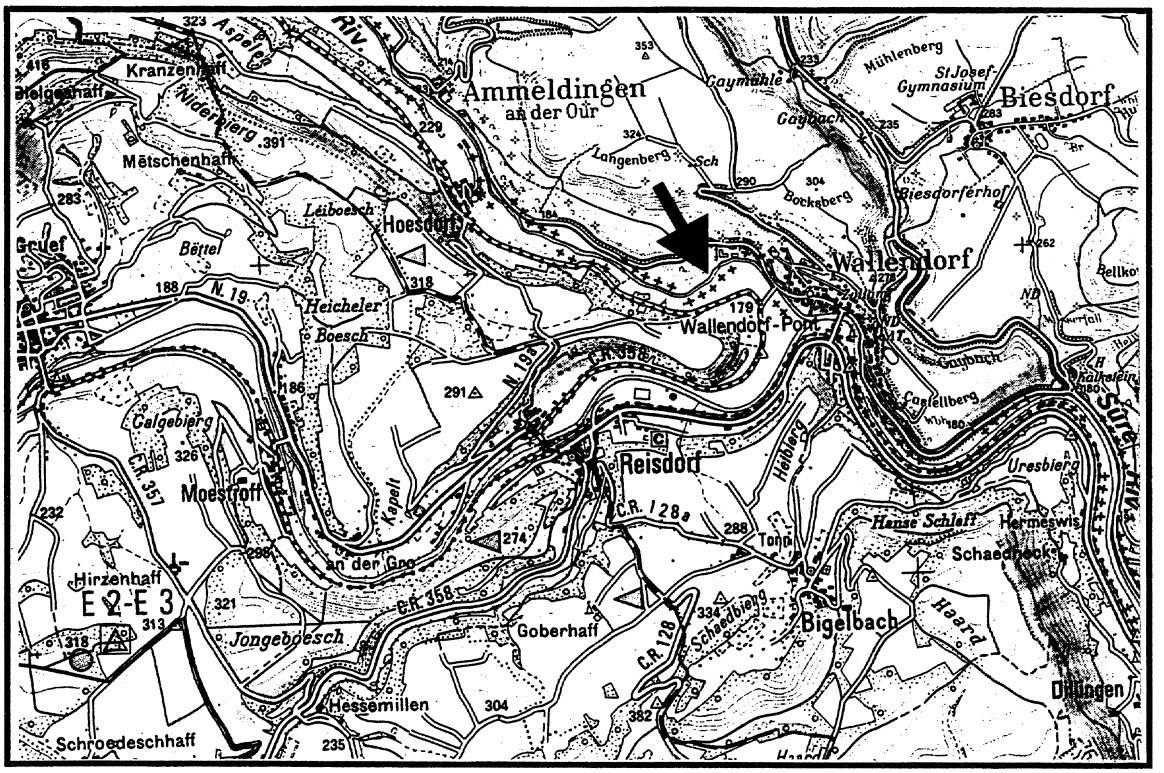
U-sample: 0-30 cm

L-sample: 253-270 cm

Our **Profile 11063**

Sampling location

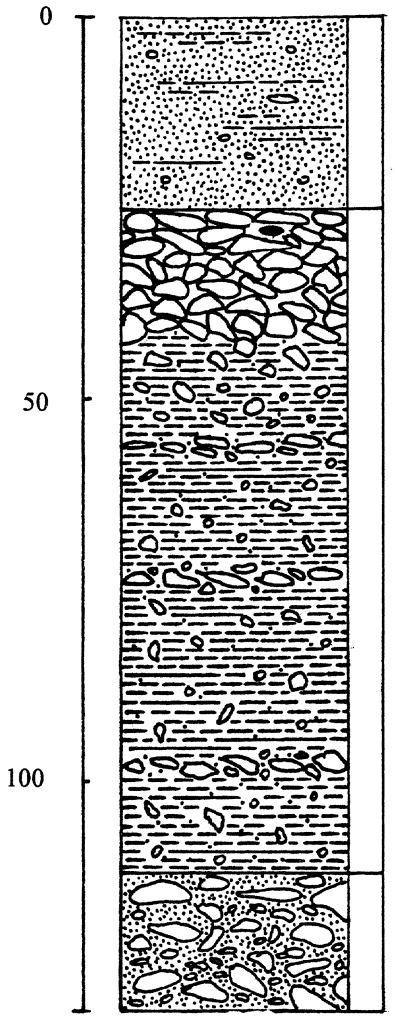
This sampling site is located at approximately 1km north-west of the Wallendorf Bridge over the Sûre or Sauer in Wallendorf. This village is situated at the confluence between Sauer and Our, 30km north-north-west from Luxembourg-city.



Coordinates:	49° 52' 45''	N	Map scale:	(1:50000)	
	06° 16' 42''	E	Map:	Luxembourg Nord	
Altitude:	180	m	Date:	04/10/1994	

Our **Profile 11063**

Profile description



0-25cm : Brownish red coloured, silty sand with some clay and scattered gravel (ϕ 2-50mm)

25-112cm : Brownish red coloured sandy silt with some clay and scattered gravel, which also forms the matrix of the gravel beds in this horizon. The thickness of these beds ranges between 8 and 17 cm. The gravel consists of weathered sandstone, white quartzite and some glazed tile fragments.

112-130cm : Brownish red coloured coarse grained sand, with abundant gravel scattered throughout the horizon

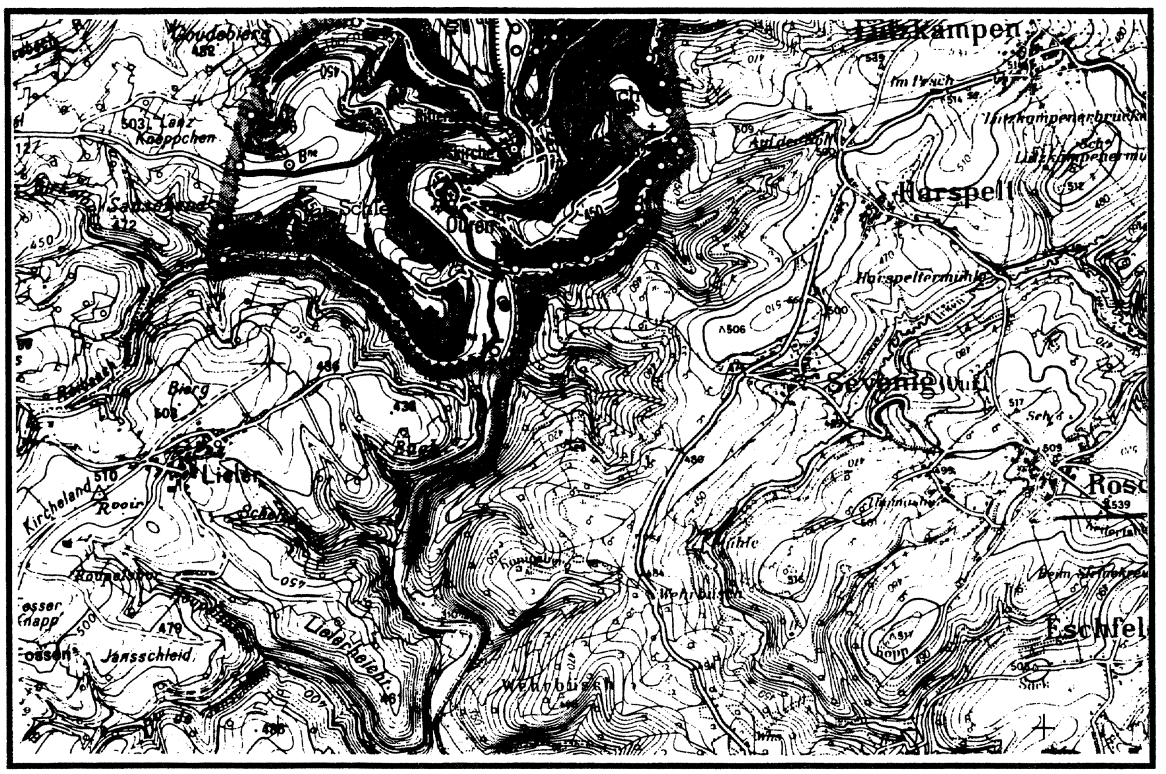
U-sample: 0-25 cm

L-sample: 103-112 cm

Our **Profile 11064**

Sampling location

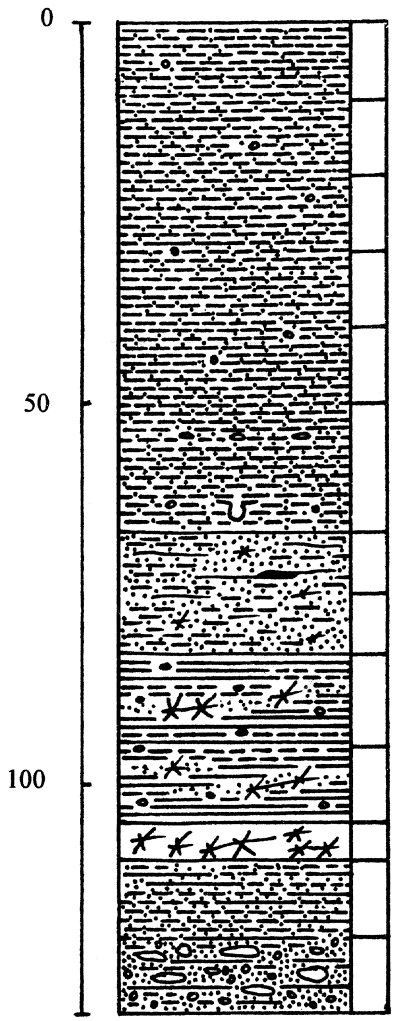
This sampling site is located at approximately 750m south-east of the church of Ouren, a village situated in the border region of Belgium, Luxembourg and Germany.



Coordinates:	50° 07' 54''	N	Map scale:	(1:50000)
	06° 08' 07''	E	Map number:	61
Altitude:	300	m	Date:	23/08/1994

Our **Profile 11064**

Profile description



0-67cm : Brown coloured sandy silt or silty sand with scattered small gravel and dark brown coloured bioturbation traces

67-83cm : Beige grey coloured fine grained silty sand with scattered Fe-oxide spots and thin black layers with Mn-oxide

83-105cm : Beige grey coloured silty to sandy clay with thin sandy Fe-oxide bands and thin shale fragments

105-110cm : Silty ironstone

110-130cm : Marine grey coloured, clay-rich sandy silt at the top, gravel with a matrix of clay-rich silty sand at the bottom

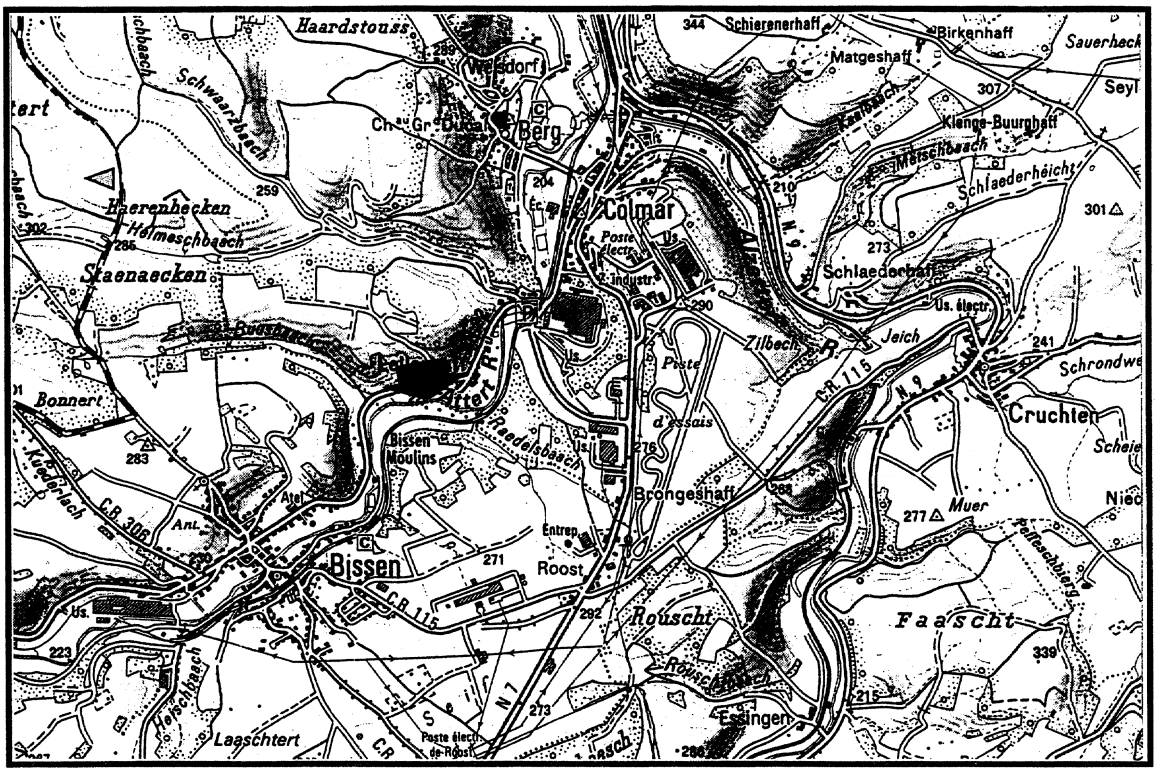
U-sample: 0-20 cm

L-sample: 110-130 cm

Attert **Profile 11065**

Sampling location

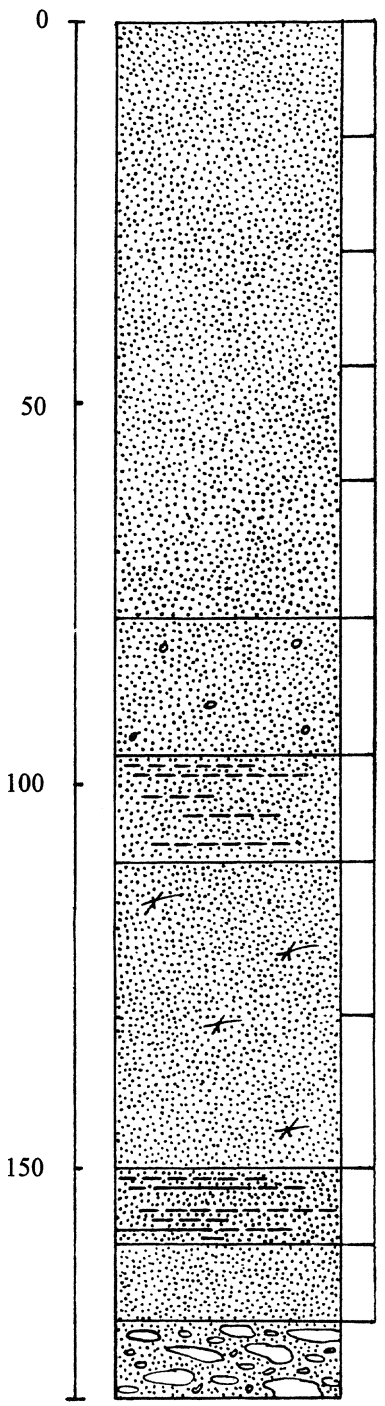
This sampling site is located at approximately 2km south-west of the centre of Colmar-Berg, a village situated at some 5km south of Ettelbrück in Luxembourg .



Coordinates:	49° 47' 02''	N	Map scale:	(1:50000)
	06° 04' 35''	E	Map:	Luxembourg Sud
Altitude:	220	m	Date:	12/10/1994

Attert **Profile 11065**

Profile description



0-78cm : Brown coloured fine to medium grained sand. The rooting zone extends to a depth of 30 cm

78-96cm : Red coloured fine to medium grained sand with small pebbles (ϕ 0,6 to 2,5cm) scattered throughout the horizon. The pebbles consist of white quartz and dark quartzite

96-110cm : Brown coloured silty, fine to medium grained sand

110-150cm : Light brown to beige-brown coloured sand with abundant Fe-oxide spots and little black spots (possibly charcoal or Mn). At 115 cm depth vague remainders of a horizontal lamination appear. There is a horizontal concentration of mica at about 120 and 130 cm depth

150-160cm : Reddish beige, silty clay with sand and beige to rusty coloured medium sand with mica. More downward undulating, black layers of 1 mm appear (possibly charcoal).
160-170cm : Red coloured, medium grained sand, irregularly bounded

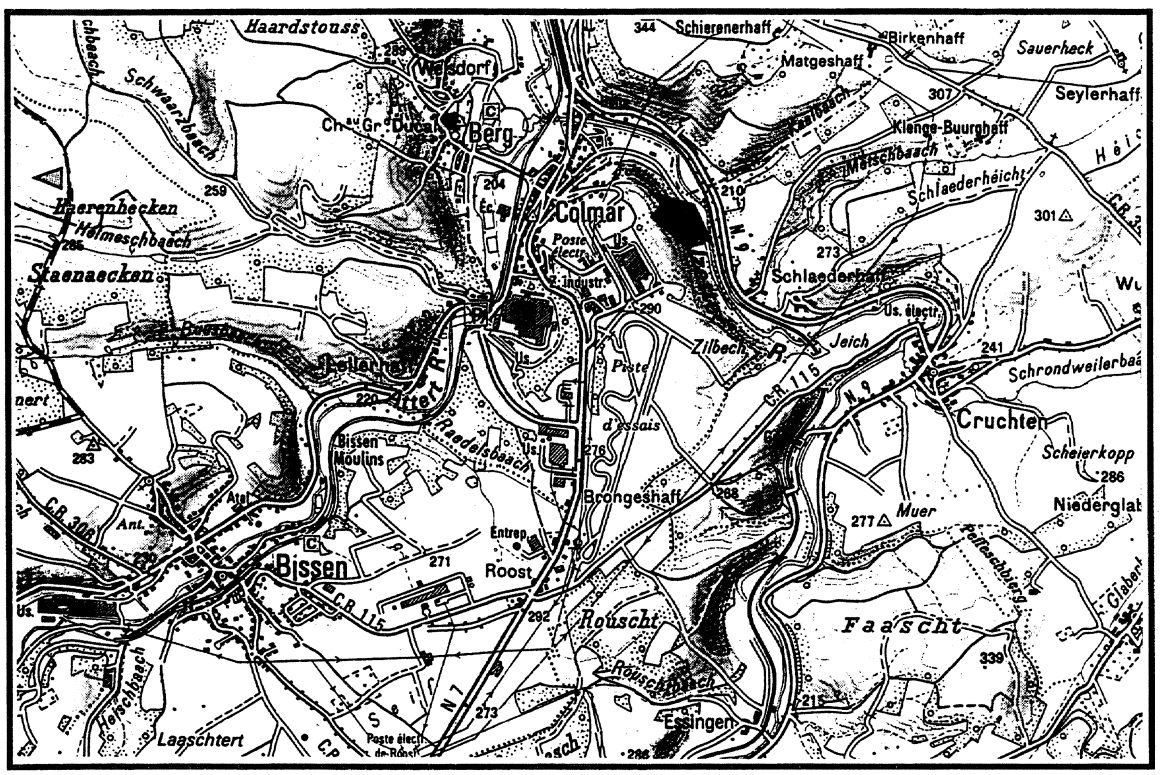
170-180cm : Flat sandstone pebbles (ϕ 2 to 7cm) and potato-shaped white quartzite in a matrix of fine gravel and coarse grained sand, slightly water-bearing, overlaying grey coloured, medium grained sand with black spots

U-sample: 0-30 cm

L-sample: 130-150 cm

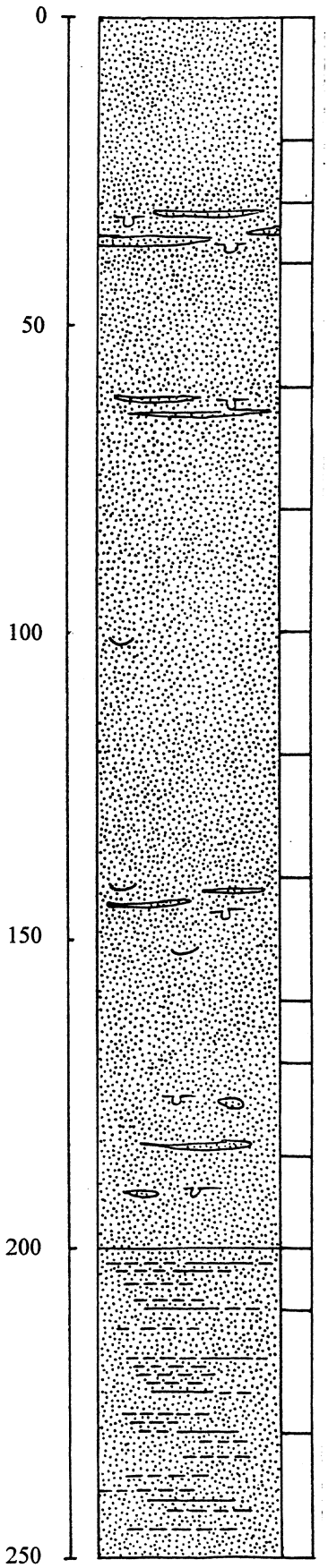
Sampling location

This sampling site is located at approximately 1.5km east of the centre of Colmar-Berg, a village situated at some 5km south of Ettelbrück in Luxembourg.



Coordinates:	49° 47' 38''	N	Map scale:	(1:50000)	
	06° 05' 50''	E	Map:	Luxembourg Sud	
Altitude:	203	m	Date:	13/10/1994	

Alzette **Profile 11066**



Profile description

0-15cm : Beige coloured sand with rooting zone

15-200cm : Brown coloured sand. From 30 to 40cm depth, thin beige coloured layers of sand with bioturbations filled with brown fine sand occur. Little shells appear at 100, 140 and 160cm depth. At 65, 145 and 185cm, beige sandlayers with bioturbations occur

200-250cm : Brown coloured fine grained sand to silty fine grained sand with some clay

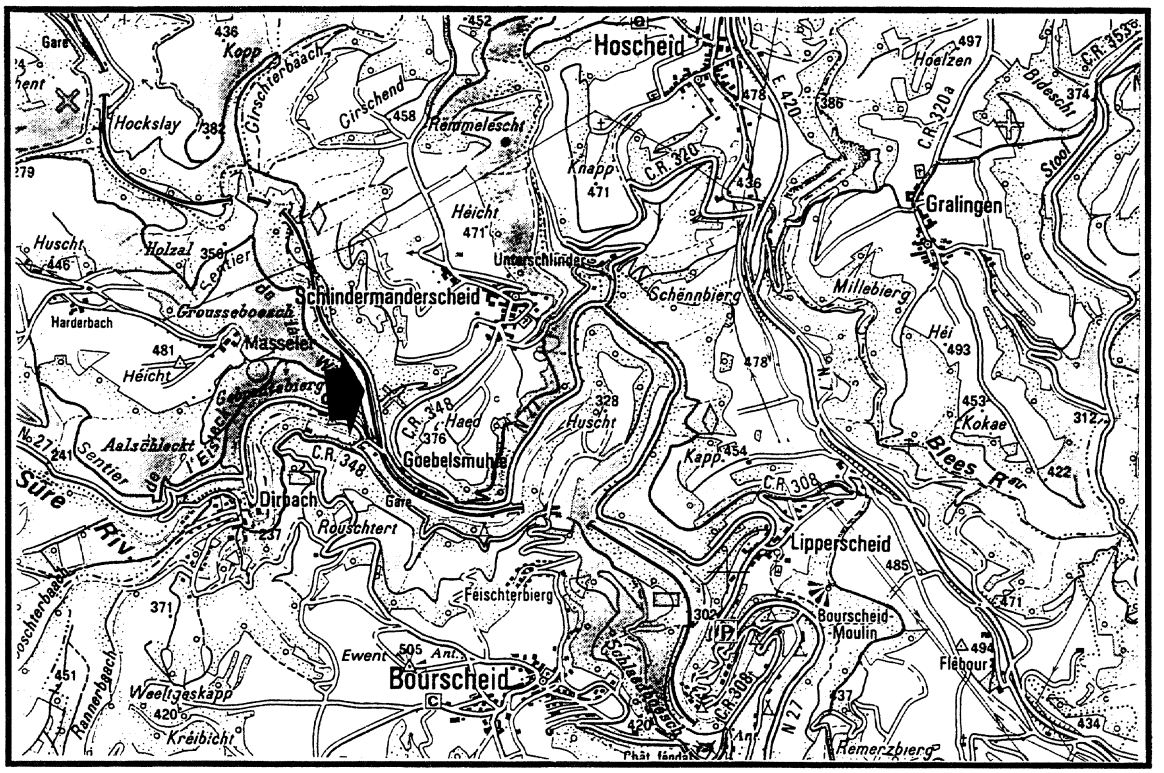
U-sample: 0-20 cm

L-sample: 230-250 cm

Wiltz **Profile 11067**

Sampling location

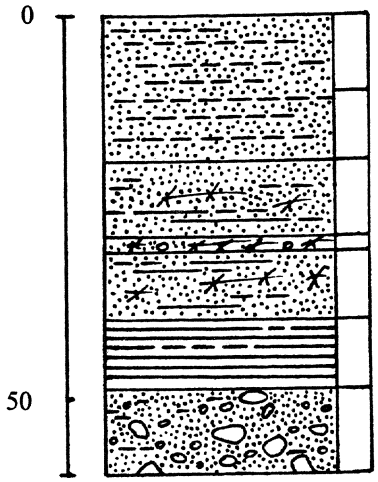
This sampling site is located at approximately 500m north of the confluence of the Wiltz and Sûre in Goebelsmuhle, a village situated at some 40km north of Luxembourg-city.



Coordinates:	49° 55' 24''	N	Map scale:	(1:50000)	
	06° 02' 56''	E	Map:	Luxembourg Nord	
Altitude:	240	m	Date:	05/10/1994	

Wiltz **Profile 11067**

Profile description



0-19cm : Coarse grained silty sand with a few pieces of plastic

19-40cm : Grey coloured, clayey, silty, fine to coarse grained sand with some clay and Fe-oxide spots. From 29 to 31 cm depth, a coarse grained layer almost consolidated with Fe-oxide spots occurs

40-49cm : Grey coloured silty clay

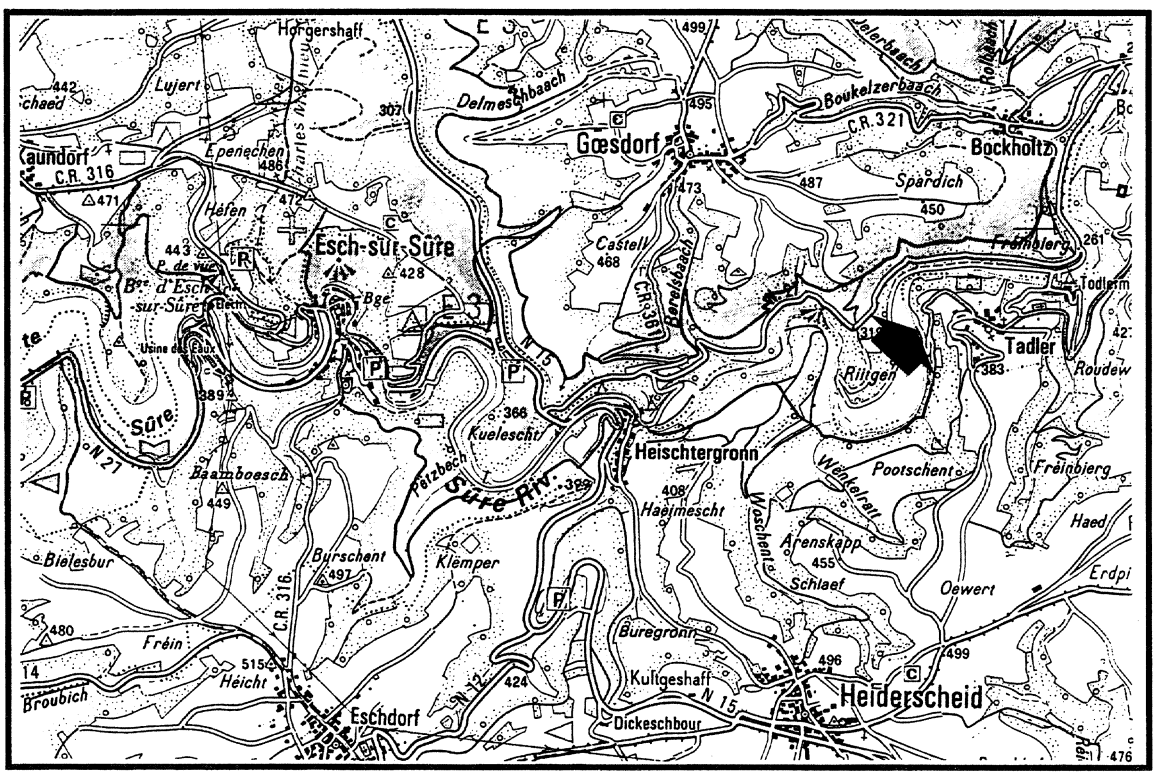
49-60cm : Gravel-bed with many roots

U-sample: 0-19 cm

L-sample: 40-49 cm

Sampling location

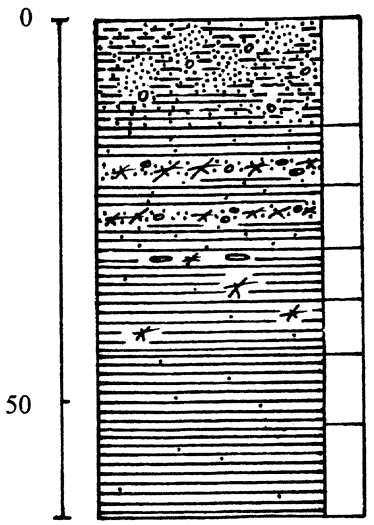
This sampling site is located at approximately 2.5km south-east of the church of Goesdorf a village situated at some 40km north-north-west of Luxembourg-city, in Luxembourg.



Coordinates:	49° 54' 57''	N	Map scale:	(1:50000)	
	05° 59' 28''	E	Map:	Luxembourg Nord	
Altitude:	260	m	Date:	05/10/1994	

Sûre **Profile 11068**

Profile description



0-14cm : Brown coloured rooting zone with non-homogeneous texture; mainly silty sand with little pebbles and clayey silt

14-30cm : Grey coloured marine clay with a little bit sand and with two layers (2,5 mm) consisting of sand, little black stones and Fe-oxide spots

30-44cm : Rusty to brown coloured homogeneous clay with a gradual downward transition to the underlying horizon

44-65cm : Homogeneous light brown coloured clay with a little bit sand

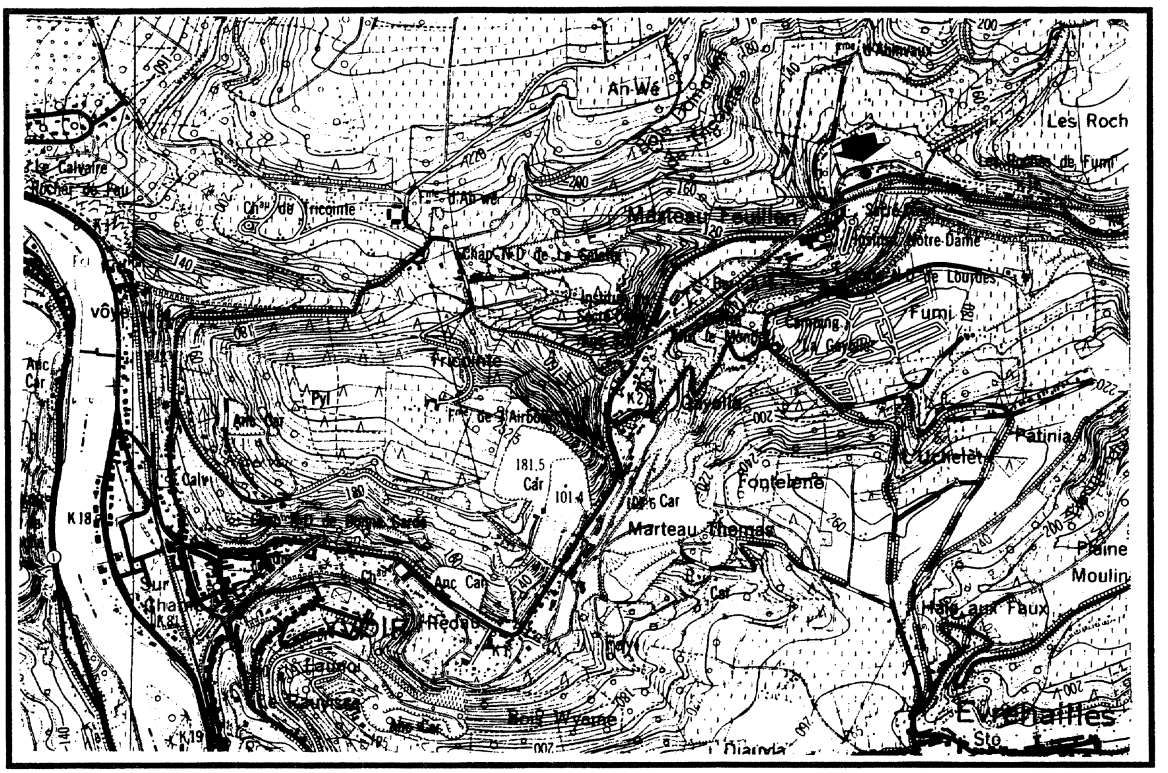
U-sample: 0-14 cm

L-sample: 44-65 cm

Bocq **Profile 11069**

Sampling location

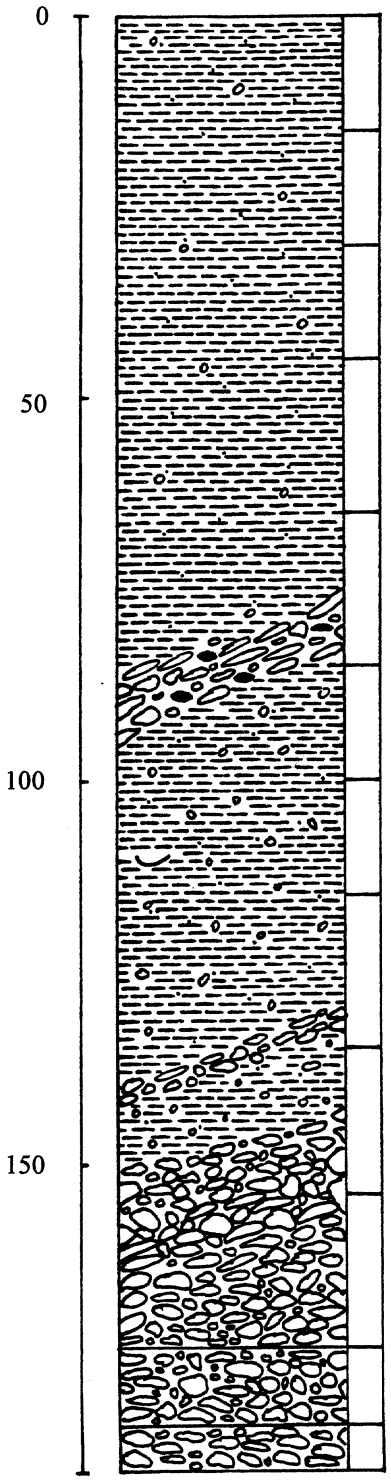
This sampling site is located at approximately 2,5km north-east of the church of Yvoir, a village situated along the Meuse river, at some 15km south of Namur.



Coordinates:	50° 20' 24''	N	Map scale:	(1:25000)
	04° 54' 32''	E	Map number:	53/3-4
Altitude:	105	m	Date:	01/07/1994

Bocq **Profile 11069**

Profile description



0-75cm : Brown coloured silt with a few grains of sand and some pebbles (ϕ 6-8 mm). The boundary with the underlying horizon is oblique and varies from 75 cm depth on the right to 85 cm on the left side. The upper 20 cm of the layer appears darker

75-85cm : A 10 cm thick gravel-bed containing flat strongly weathered pebbles (ϕ 3 mm- 8 cm), limestone, (psammitic) sandstone and slag fragments. The padding material is darker and perhaps a bit more sandy then the other horizons

85-130cm : Brown coloured silt with abundant weathered pebbles. Shells (bivalves) appear at 100 cm depth

130-174cm : Gravel-bed containing limestone, sandstone and pebbles, with an oblique upper limit; from 140 cm on the left to 130 cm on the right. A 10 cm thick brown coloured, pebble-rich silt interrupts the gravel-bed. The pebbles upwards of the silt layer are big and angular. The pebbles underneath the silt are rather small

174-190cm : Light, marine grey gravel-bed with chert and limestone pebbles

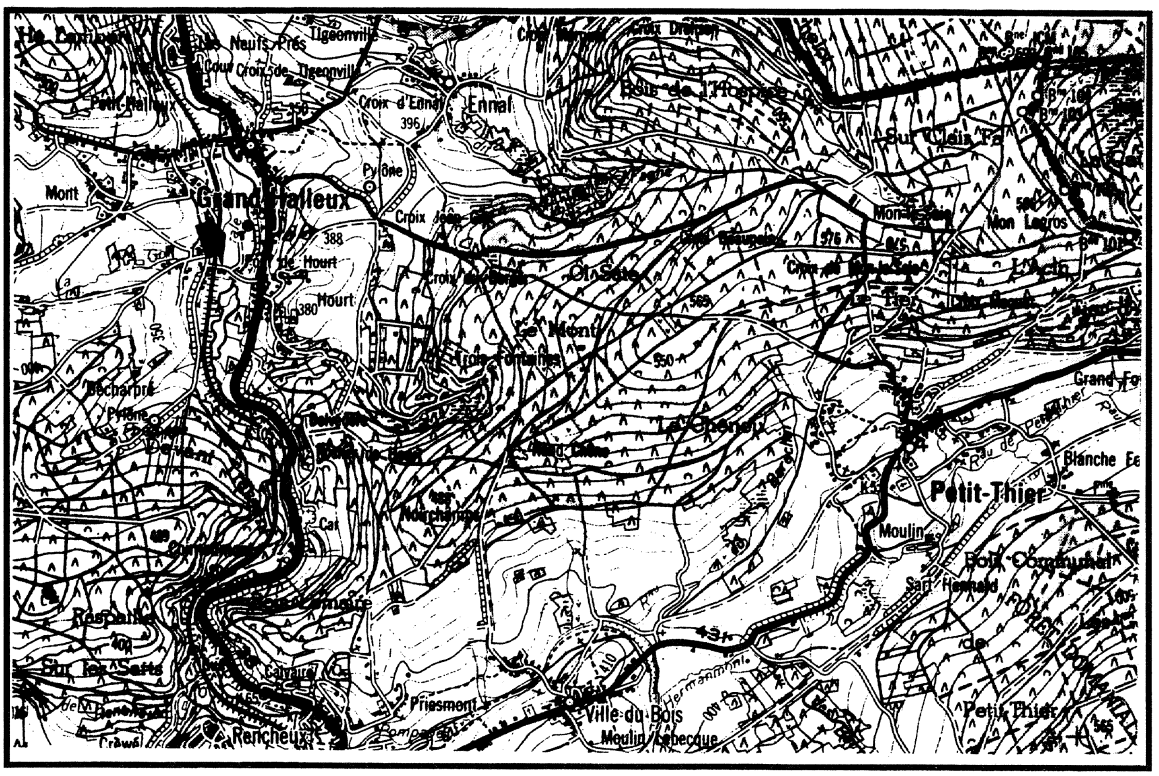
U-sample: 5-25 cm

L-sample: 135-154 cm

Salm **Profile 11070**

Sampling location

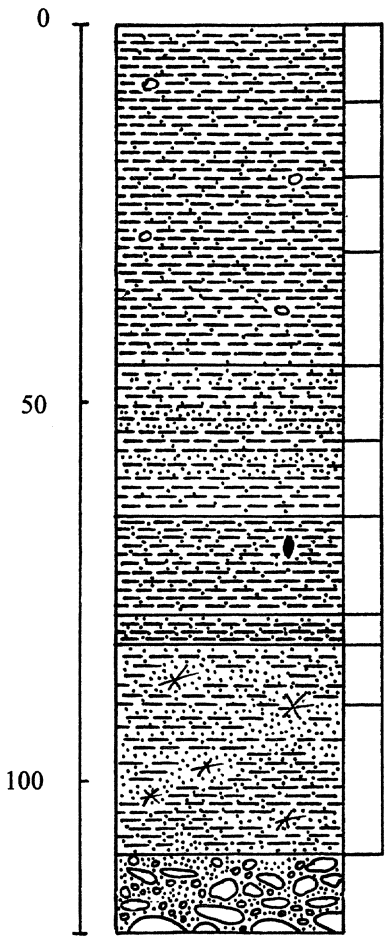
This sampling site is located at approximately 500m south of the church of Grand-Halleux, a village situated at some 10km south-west of Stavelot, in the south-eastern part of the province of Liège.



Coordinates:	50° 19' 10''	N	Map scale:	(1:50000)
	05° 54' 40''	E	Map number:	56
Altitude:	315	m	Date:	29/06/1994

Salm **Profile 11070**

Profile description



0-45cm : Brown coloured sandy silt with scattered gravel (ϕ 7 mm)

45-65cm : Rusty and grey coloured sandy silt

65-78cm : Light brown coloured sandy silt with black spots (charcoal or Mn-oxide)

78-82cm : Rusty sandy silt with Fe-oxide spots and gravel (ϕ 1.5cm)

82-115cm : Grey coloured sandy silt with Fe-oxide spots and coarser grains

115-125cm : Coarse sand with small pebbles (ϕ 5-7cm), with low sphericity and slight round off. Outstreaming water has a H_2S-smell

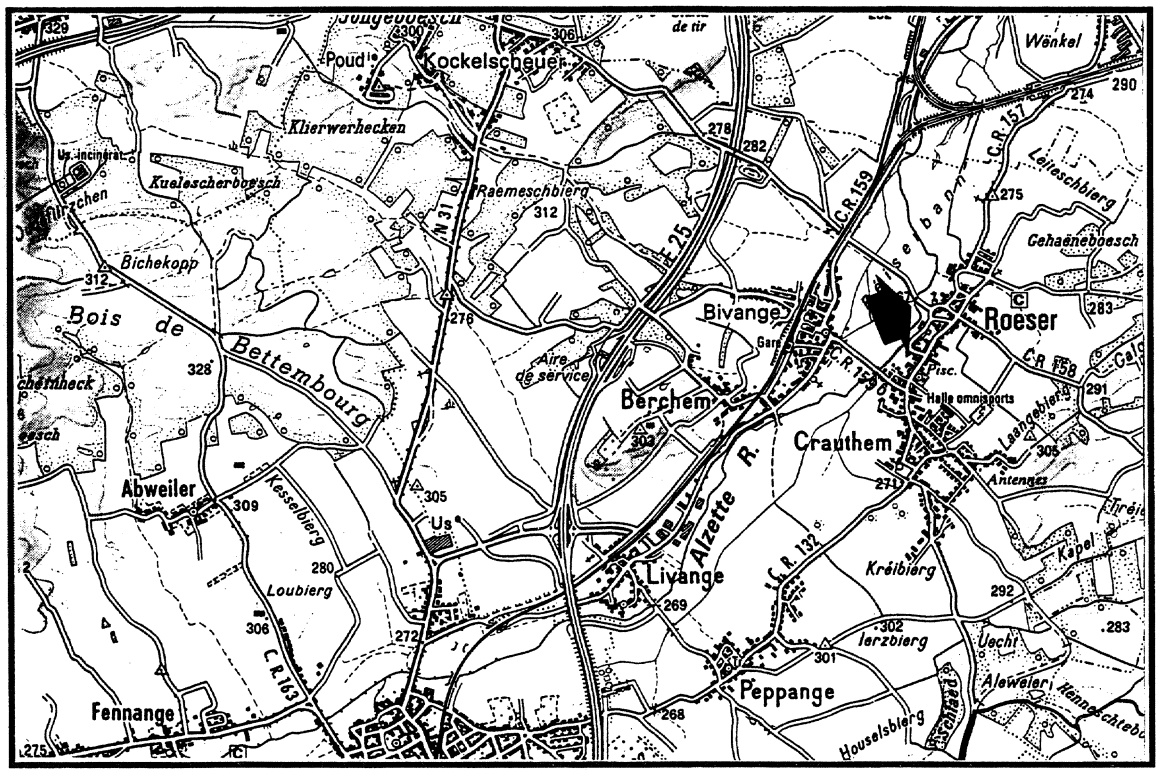
U-sample: 5-25 cm

L-sample: 90-110 cm

Alzette **Profile 11071**

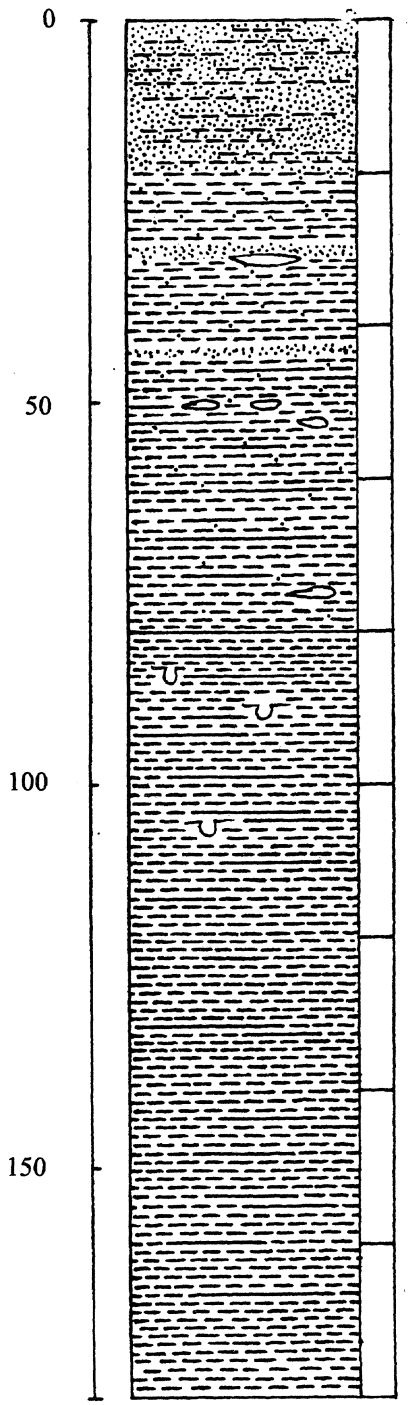
Sampling location

This sampling site is located at approximately 250m west of the church of Roeser, a village situated at some 7km south of Luxembourg-city, in Luxembourg.



Coordinates:	49° 31' 54''	N	Map scale:	(1:50000)	
	06° 08' 33''	E	Map:	Luxembourg Sud	
Altitude:	267	m	Date:	18/10/1994	

Profile description



0-80cm : Brown coloured layer with changing grain size. The upper layer consists mainly of silty sand. At 30 and 48 cm depth, medium to coarse sand occurs. The rest of the horizon mainly consists of silt to clayey silt. Plastic appears at 35 cm depth. At 35, 50 and 55 cm depth, small bioturbated layers of rolled, sedimentated, beige coloured clay bars occur. At 75 cm depth, there is a layer of beige yellow clay (the same material as below).

80-180cm : beige yellow coloured material consisting of dry, hard clay. In the upper part, bioturbations filled with sand of the overlaying horizon occur.

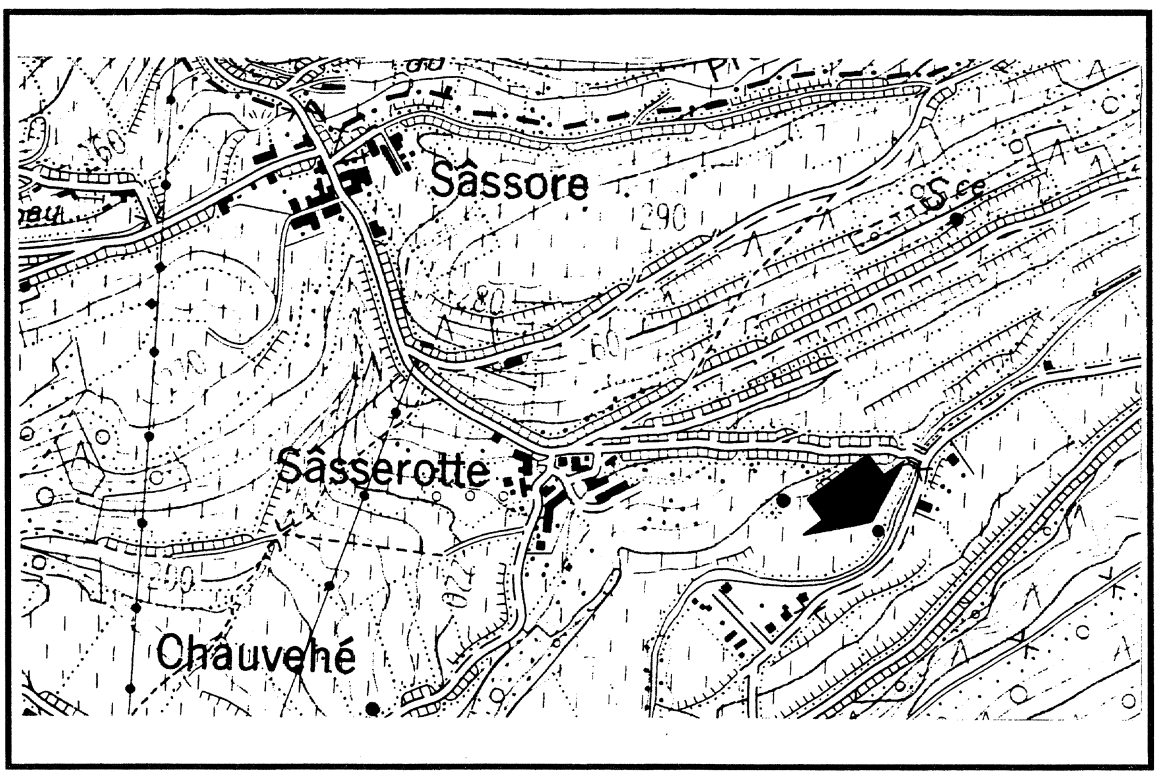
U-sample: 0-20 cm

L-sample: 160-180 cm

Hoegne **Profile 11072**

Sampling location

This sampling site is located at approximately 400m west of the centre of Sâsserotte, a village situated at some 4km north-north-west of Spa, in the eastern part of the province of Liège.

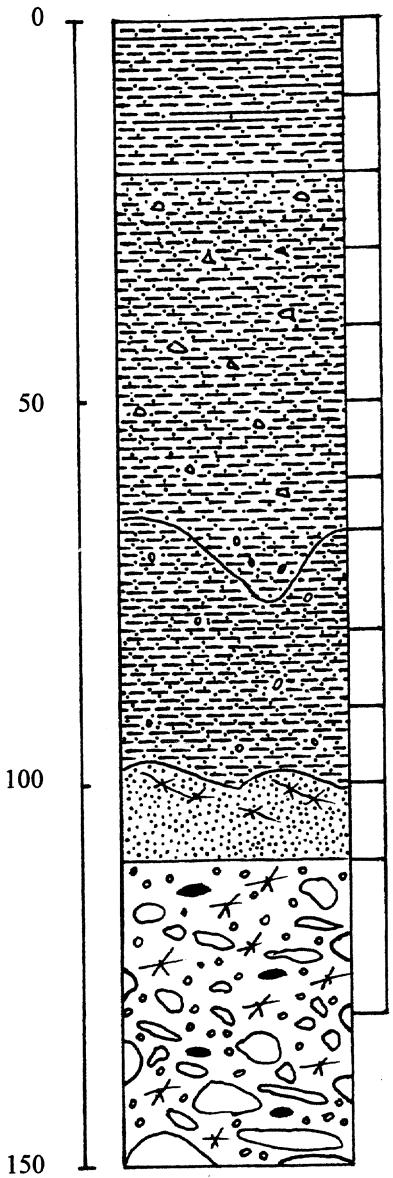


Coordinates:	50° 31' 34''	N	Map scale:	(1:10000)
	05° 50' 55''	E	Map number:	49/3-4
Altitude:	198	m	Date:	22/10/1994

Hoegne

Profile 11072

Profile description



0-20cm : Brown coloured sandy silt with clay

20-67cm : Fine angular gravel (ϕ 1-3mm) in a matrix consisting of brown coloured sand to sandy silt. The irregular border with the underlying horizon looks like a bioturbation, filled with coarse sand and gravel

67-100cm : Brown coloured sandy silt with some fine gravel

100-110cm : Light beige coloured, fine grained sand with Fe-oxide spots that suggest ripple bedding

110-150cm : The rest of the profile consists of gravel (mainly quartz, quartzite, sandstone and blue or green coloured slags & pebbles) of various size (ϕ 7mm-30cm), cemented by Fe-oxide. Gas bubbles and fluid structures also occur. The gravel is badly rounded and has a low sphericity.

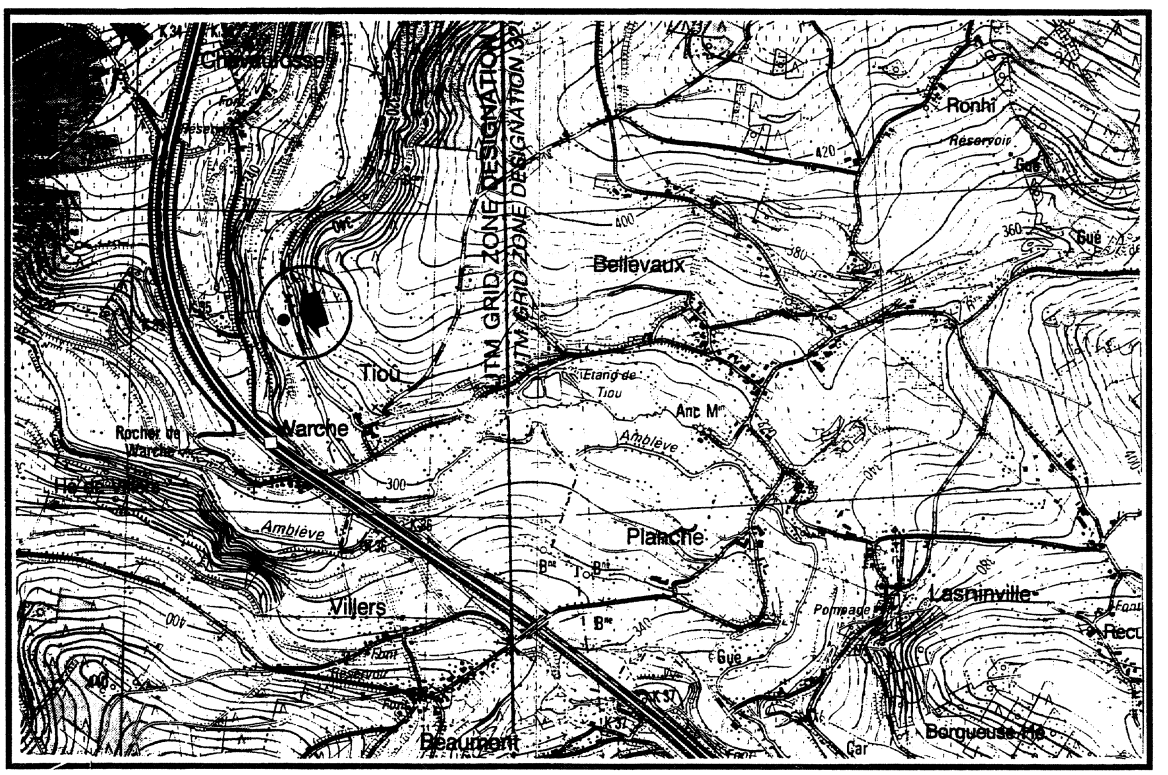
U-sample: 0-20 cm

L-sample: 80-100 cm

Warche **Profile 11073**

Sampling location

This sampling site is located at approximately 500m north of the hamlet of Warche, 750m upstream of the confluence of the Warche and Amblève. Warche is situated at some 5km east of Stavelot, in the eastern part of the province of Liège.

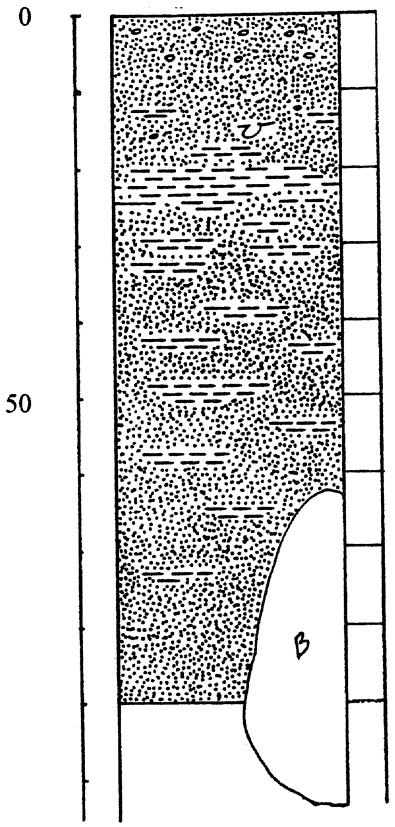


Coordinates:	50° 23' 31''	N	Map scale:	(1:25000)
	05° 59' 20''	E	Map number:	50/5-6
Altitude:	297	m	Date:	23/09/1994

Warche

Profile 11073

Profile description



0-98cm : This profile has a homogeneous brown colour without sedimentation characteristics. The grainsize distribution gradually changes from coarse grained sand with fine gravel at the top to sandy silt at 20cm depth. From there downwards, a slight coarsening takes place. In the upper 20cm, a bioturbation filled with chestnut brown sediment occurs. No artefacts or pieces of charcoal appear in this profile

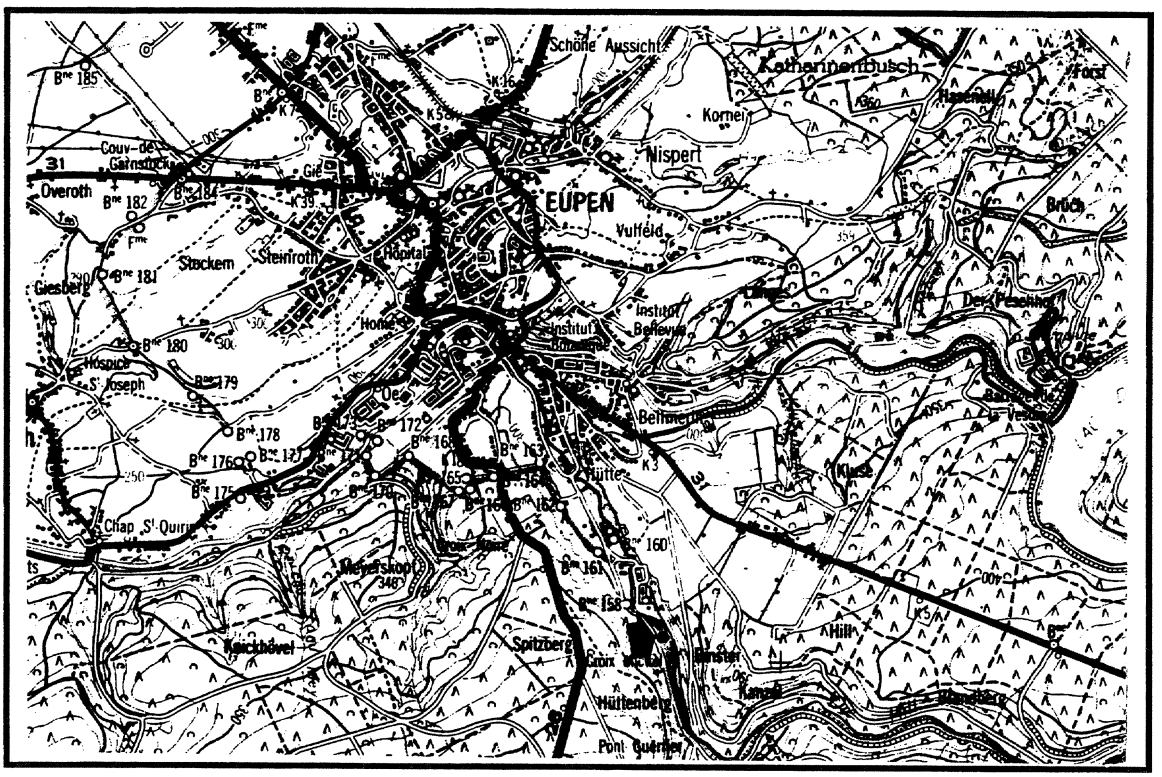
U-sample: 0-20 cm

L-sample: 70-90 cm

Helle (Hill) **Profile 11075**

Sampling location

This sampling site is located at approximately 1,5km south-south-east of the centre of Eupen, a town situated in the most eastern part of the province of Liège.

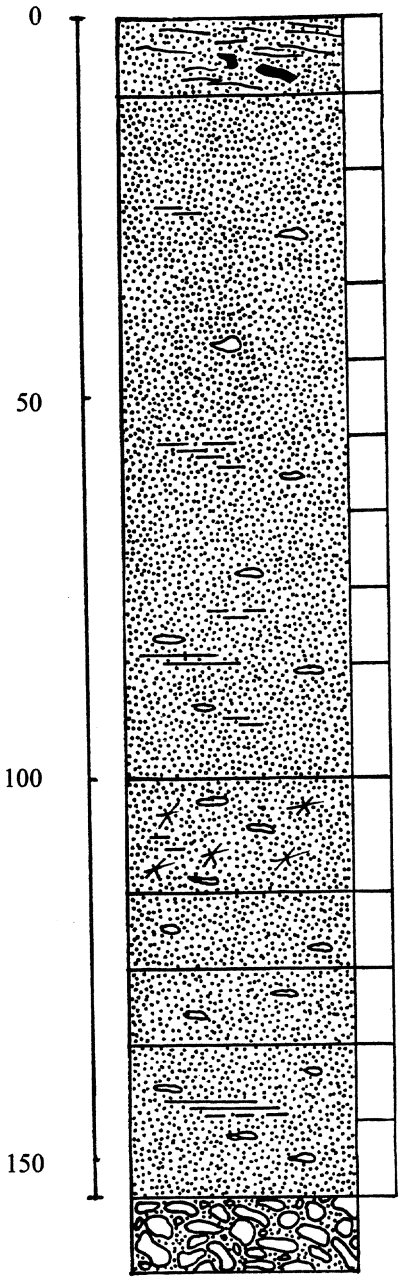


Coordinates:	50° 36' 22''	N	Map scale:	(1:50000)
	06° 03' 04''	E	Map number:	43
Altitude:	300	m	Date:	19/11/1994

Helle (Hill)

Profile 11075

Profile description



0-10cm : Dark coloured, badly sorted humus- and silt-rich sand

10-100cm : Light brown coloured, badly sorted medium to coarse grained sand with randomly spread pebbles (ϕ max. 5cm). This horizon may be part of a coarsening upward trend

100-115cm : Light brown to orange coloured, fine to medium grained sand with small pebbles (ϕ max. 3cm)

115-125cm : Light brown coloured, medium to coarse grained sand with small pebbles (ϕ max. 3cm)
125-135cm : Light brown coloured, coarse grained sand with small pebbles (ϕ max. 3cm)

135-157cm : Light brown coloured, badly sorted sand with small pebbles (ϕ max. 3cm). Proportionally the clay & silt fractions are more abundant than in the rest of the profile

157-165cm : Badly sorted boulder bed (ϕ max. 30cm), with pebbles and coarse, humus-rich sand in between. Boulders consisting of dark coloured quartzite (not sampled)

U-sample: 10-35 cm

L-sample: 135-157 cm

Annexe III

Results of the chemical analysis

L-U-S-samples

L - sample

Site	SiO_2 (%)	TiO_2 (%)	Al_2O_3 (%)	Fe_2O_3 (%)	MnO (%)	MgO (%)	CaO (%)	Na_2O (%)	K_2O (%)	P_2O_5 (%)	SO_3 (%)	LOI (%)	Org. C (%)	As ppm	Ba ppm
01	81.80	0.787	6.48	2.35	0.080	0.56	1.27	0.87	1.69	0.070	< 0.05	3.76	0.40	9	314
02	73.28	0.695	7.19	2.41	0.084	0.82	4.92	0.80	1.80	0.080	< 0.05	7.53	0.46	16	337
03	70.73	0.740	11.21	5.73	0.314	0.85	0.41	0.55	2.27	0.140	0.05	6.53	1.26	17	477
04	75.71	0.793	10.15	4.21	0.140	0.80	0.41	0.73	1.92	0.090	< 0.05	4.62	0.46	9	346
05	72.23	0.692	10.40	4.37	0.074	0.94	0.61	0.48	2.20	0.100	0.14	7.34	1.66	17	366
06	m	m	m	m	m	m	m	m	m	m	m	m	m	m	m
07	81.76	0.683	6.86	2.09	0.029	0.46	1.32	1.04	1.84	0.070	0.08	3.46	0.25	6	338
08	91.49	0.352	2.14	0.90	0.019	0.07	0.17	0.22	0.96	0.070	< 0.05	3.24	1.36	10	240
09	84.39	0.375	5.61	2.37	0.011	0.45	0.21	0.28	1.86	0.030	0.15	4.10	1.26	18	279
10	85.19	2.309	4.05	2.34	0.065	0.30	0.44	0.64	1.15	0.070	< 0.05	1.84	0.16	18	236
11	89.26	0.578	2.93	1.52	0.019	0.19	0.21	0.38	1.27	0.030	< 0.05	3.25	1.17	5	253
12	87.24	0.764	5.19	1.70	0.031	0.36	0.21	0.43	1.41	0.040	< 0.05	2.19	1.28	13	277
15	80.75	0.677	6.74	2.46	0.086	0.50	1.52	0.98	1.84	0.110	0.19	3.90	0.58	3	334
16	74.86	0.585	6.09	6.98	0.132	0.54	1.25	0.69	1.68	0.380	0.23	6.32	1.09	18	367
17	85.49	0.611	5.27	1.78	0.045	0.35	0.97	0.93	1.65	0.070	0.21	2.31	0.37	9	311
18	83.95	0.728	6.73	2.02	0.023	0.42	0.51	1.06	1.73	0.060	0.09	2.41	0.25	2	358
19	86.86	0.697	4.89	1.71	0.074	0.32	0.43	0.69	1.47	0.040	0.09	2.36	0.44	12	283
21	58.54	0.267	2.60	17.89	0.057	0.17	1.09	0.16	0.73	3.000	0.25	15.22	5.07	29	225
22	92.30	0.277	2.52	0.61	0.011	0.07	0.20	0.36	1.02	0.010	0.10	2.26	0.78	14	235
23	62.01	0.379	7.55	13.08	0.018	1.79	1.69	0.24	4.19	1.080	0.15	7.47	0.42	34	249
24	60.56	0.662	10.13	5.76	0.109	1.16	4.72	0.68	2.07	0.320	0.55	12.91	2.39	18	321
25	77.70	0.508	5.81	2.51	0.031	0.53	2.05	0.70	1.51	0.310	0.65	7.12	1.83	17	655
26	80.69	0.706	7.86	2.78	0.049	0.57	0.50	0.99	1.92	0.070	0.13	3.47	0.49	12	350
27	85.42	0.503	6.15	1.83	0.019	0.30	0.43	0.86	1.54	0.060	0.14	2.40	0.20	4	314
28	88.10	0.685	4.49	1.66	0.036	0.23	0.48	0.77	1.33	0.040	0.12	1.50	0.07	11	250
29	80.32	0.741	6.95	3.80	0.031	0.73	0.61	0.67	1.77	0.060	0.14	3.85	0.04	11	278
30	79.65	0.700	6.62	2.66	0.051	0.54	2.26	0.94	1.72	0.090	0.15	4.33	0.23	15	342
32	77.58	0.678	7.84	3.44	0.043	0.64	0.66	0.93	1.93	0.140	0.15	5.66	1.10	10	339
33	76.59	0.647	6.81	2.42	0.054	0.54	3.25	0.97	1.65	0.160	0.29	6.23	0.75	7	307
34	77.79	0.583	6.41	2.97	0.027	0.50	3.24	0.80	1.49	0.080	0.19	5.59	0.18	8	295
37	83.81	0.534	5.27	1.36	0.017	0.24	0.39	0.93	1.34	0.040	0.05	5.64	2.27	3	302
38	88.63	0.584	4.15	1.05	0.024	0.20	0.45	0.74	1.30	0.030	0.06	2.47	0.70	3	270
39	72.74	0.601	7.69	3.69	0.110	0.71	3.71	0.74	1.61	0.150	0.11	7.71	0.53	15	317

m = missing data

L - sample

Site	SiO_2 (%)	TiO_2 (%)	Al_2O_3 (%)	Fe_2O_3 (%)	MnO (%)	MgO (%)	CaO (%)	Na_2O (%)	K_2O (%)	P_2O_5 (%)	SO_3 (%)	LOI (%)	Org. C (%)	As ppm	Ba ppm
42	81.82	0.529	5.50	2.93	0.048	0.36	0.49	0.71	1.33	0.190	0.07	5.65	3.48	14	319
43	73.27	0.342	5.35	2.00	0.022	0.73	6.75	0.72	1.53	0.060	0.77	8.10	0.81	6	259
44	69.41	0.431	4.57	2.22	0.061	0.63	8.57	0.55	1.08	0.180	0.31	11.65	1.61	9	303
45	79.96	0.657	6.01	2.28	0.055	0.42	1.91	0.73	1.55	0.170	0.17	5.67	0.88	4	298
46	77.33	0.831	9.93	2.73	0.029	0.75	0.49	0.96	2.07	0.091	0.02	4.47	0.43	4	371
47	64.27	0.753	11.27	8.62	0.079	0.94	0.76	0.59	2.05	0.135	0.10	9.95	2.24	23	1019
48	71.94	0.566	6.06	5.71	0.097	0.58	4.10	0.56	1.28	0.169	0.11	8.26	1.04	13	260
49	56.78	0.567	7.81	15.71	0.198	0.66	3.97	0.49	1.50	0.250	0.28	11.40	1.65	27	270
50	79.58	0.792	8.36	3.06	0.051	0.60	0.67	1.11	2.10	0.095	0.04	3.27	0.32	11	387
51	74.72	0.932	10.92	2.77	0.036	1.08	0.22	0.61	1.77	0.112	0.06	6.55	1.66	2	329
52	74.94	0.761	10.07	3.31	0.036	0.90	0.32	0.39	1.76	0.099	0.03	7.16	2.02	10	328
53	82.46	0.652	5.62	3.52	0.055	0.35	1.08	0.30	1.24	0.142	0.11	4.20	0.76	24	251
54	69.70	0.852	12.40	5.52	0.085	1.10	0.68	0.81	2.26	0.110	0.05	6.13	0.65	14	397
55	75.41	1.026	10.48	4.07	0.049	1.01	0.25	0.70	1.73	0.089	0.04	4.88	1.14	19	340
56	77.32	0.788	9.36	4.33	0.180	0.71	0.36	0.58	1.68	0.115	0.03	4.29	0.44	10	306
57	74.78	0.903	10.94	4.76	0.052	0.98	0.23	0.82	1.92	0.129	0.04	4.19	0.29	14	349
58	75.56	1.044	11.29	2.98	0.047	1.04	0.26	0.73	2.08	0.081	0.03	4.59	0.67	9	394
59	74.95	0.824	11.46	4.10	0.086	1.09	0.21	0.82	2.08	0.076	0.03	4.02	0.54	13	365
60	72.31	0.844	13.04	4.39	0.156	0.71	0.23	0.67	2.44	0.076	0.03	4.82	0.76	19	536
61	73.65	0.858	11.21	5.50	0.059	0.79	0.23	0.50	2.02	0.070	0.03	4.82	0.55	23	373
62	73.36	0.762	7.81	3.06	0.089	2.60	2.74	0.38	2.29	0.083	0.06	6.40	0.18	11	293
63	75.11	0.864	9.90	3.57	0.031	1.57	0.92	0.39	2.74	0.096	0.06	4.40	0.42	8	344
64	71.13	0.797	11.62	5.42	0.122	0.90	0.20	0.57	2.10	0.106	0.03	6.74	2.03	12	445
65	83.94	0.941	4.66	2.30	0.069	0.85	0.70	0.21	1.07	0.102	0.08	4.76	1.29	5	196
66	82.78	0.743	6.37	2.90	0.070	0.91	0.47	0.31	1.39	0.091	0.04	3.68	0.37	9	241
67	59.96	0.810	14.32	5.81	0.096	1.27	0.36	0.69	2.45	0.450	0.05	13.33	4.72	19	512
68	65.48	0.930	16.53	5.77	0.085	1.41	0.18	0.73	2.73	0.145	0.02	5.70	0.38	11	493
69	70.47	0.720	8.12	2.67	0.067	0.66	5.66	0.82	2.10	0.101	0.07	8.01	0.51	6	359
70	76.27	0.919	10.20	2.74	0.240	0.68	0.25	0.60	1.97	0.093	0.03	5.72	1.82	21	407
71	66.59	0.853	12.61	7.50	0.087	0.84	0.75	0.62	1.95	0.311	0.03	7.60	0.55	24	401
72	67.69	0.813	13.09	7.07	0.363	0.97	0.38	0.53	2.51	0.124	0.03	6.15	0.87	16	494
73	73.37	0.778	11.51	5.27	0.097	0.92	0.24	0.39	2.17	0.126	0.02	4.85	0.72	16	412
75	60.97	0.919	15.54	8.14	0.013	0.56	0.16	0.65	2.46	0.125	0.02	10.21	2.85	67	393

m = missing data

L - sample

Site	Cd ppm	Ce ppm	Co ppm	Cr ppm	Cs ppm	Cu ppm	Ga ppm	Hf ppm	La ppm	Nb ppm	Ni ppm	Pb ppm	Rb ppm	Sc ppm	Sn ppm	Sr ppm	Th ppm	V ppm	Y ppm	Zn ppm	Zr ppm
01	0.2	85	10	94	< 5	12	< 5	< 20	43	13	14	< 10	62	8	< 3	75	< 10	38	40	32	921
02	0.2	76	< 7	74	6	< 10	7	< 20	30	5	22	20	65	8	< 3	76	< 10	37	33	62	539
03	0.5	86	27	149	9	26	17	< 20	36	12	54	45	96	12	7	67	26	73	36	188	430
04	0.2	60	12	114	10	11	15	< 20	37	9	44	12	85	11	4	65	19	60	27	78	548
05	0.8	88	25	102	14	24	14	< 20	24	11	41	469	90	11	< 3	55	< 10	62	26	575	425
06	m	m	m	m	m	m	m	m	m	m	m	m	m	m	m	m	m	m	m	m	m
07	0.1	63	9	81	< 5	16	9	< 20	36	11	13	< 10	65	7	< 3	86	16	39	30	36	614
08	0.1	< 15	< 7	53	< 5	13	< 5	< 20	3	3	< 7	< 10	34	2	< 3	36	< 10	19	8	16	621
09	0.5	41	< 7	74	< 5	< 10	< 5	< 20	31	3	18	< 10	68	5	< 3	48	15	57	26	32	288
10	0.1	183	11	420	7	< 10	5	248	109	36	16	< 10	41	10	28	59	38	60	72	53	9095
11	0.1	45	< 7	113	< 5	< 10	< 5	31	16	11	< 7	< 10	41	4	< 3	38	15	40	8	19	1532
12	0.1	57	< 7	109	< 5	12	5	26	25	12	9	< 10	53	5	< 3	47	14	35	19	34	1122
15	0.5	41	9	78	5	< 10	5	25	31	12	9	16	64	8	< 3	87	< 10	43	31	23	709
16	0.5	75	< 7	80	6	< 10	6	28	28	11	9	29	64	6	< 3	75	< 10	48	30	35	654
17	0.7	43	10	71	< 5	< 10	7	37	18	11	< 7	18	54	6	< 3	77	12	29	27	14	770
18	0.7	52	8	88	< 5	< 10	7	34	36	16	< 7	16	59	7	< 3	82	< 10	37	33	29	806
19	0.5	55	13	91	6	< 10	< 5	25	26	12	7	23	51	5	< 3	60	< 10	33	28	22	913
21	0.7	36	< 7	47	6	< 10	< 5	< 20	9	3	< 7	16	25	3	< 3	57	< 10	33	14	24	383
22	0.2	18	< 7	42	< 5	< 10	< 5	< 20	3	8	< 7	13	31	3	< 3	41	< 10	11	9	9	535
23	0.7	159	9	252	8	< 10	7	23	62	8	9	16	131	10	< 3	111	12	137	35	37	326
24	0.9	48	15	101	9	22	11	< 20	36	12	27	59	100	12	8	138	< 10	95	28	87	346
25	2.1	39	18	83	5	93	7	< 20	30	10	18	599	55	7	33	99	< 10	46	27	830	552
26	0.9	54	13	80	< 5	< 10	8	< 20	26	13	12	22	70	8	< 3	78	14	51	32	37	584
27	0.7	33	7	70	6	< 10	6	22	16	13	< 7	10	55	4	< 3	68	< 10	34	21	12	567
28	0.7	40	< 7	148	< 5	< 10	< 5	45	26	11	< 7	11	43	5	< 3	63	< 10	17	24	22	1531
29	0.9	67	12	128	9	< 10	8	32	30	12	18	19	66	8	< 3	65	< 10	73	32	43	841
30	1.1	69	< 7	82	7	< 10	7	22	33	12	11	13	62	8	< 3	83	< 10	41	31	38	717
32	0.9	62	18	86	< 5	16	5	< 20	22	11	14	27	77	9	< 3	79	< 10	64	31	67	515
33	1.1	52	11	75	6	12	8	32	28	12	12	23	64	7	< 3	97	11	41	37	34	577
34	1.4	53	< 7	80	< 5	< 10	8	< 20	29	10	9	15	55	7	< 3	104	< 10	42	20	43	644
37	0.2	51	8	79	< 5	< 10	< 5	< 20	19	11	< 7	17	42	6	< 3	63	< 10	28	21	32	850
38	0.2	48	12	86	< 5	< 10	< 5	36	24	10	< 7	12	41	4	< 3	60	< 10	24	19	16	1070
39	0.7	69	11	86	9	< 10	9	20	17	11	19	22	69	8	< 3	107	< 10	56	31	63	551

m = missing data

L - sample

Site	Cd ppm	Ce ppm	Co ppm	Cr ppm	Cs ppm	Cu ppm	Ga ppm	Hf ppm	La ppm	Nb ppm	Ni ppm	Pb ppm	Rb ppm	Sc ppm	Sn ppm	Sr ppm	Th ppm	V ppm	Y ppm	Zn ppm	Zr ppm
42	0.7	54	17	77	6	< 10	< 5	< 20	18	10	< 7	18	48	6	< 3	62	< 10	42	25	33	519
43	1.1	27	11	50	< 5	< 10	< 5	< 20	12	7	< 7	< 10	55	5	< 3	233	< 10	37	16	25	220
44	1.4	48	< 7	62	< 5	19	< 5	< 20	19	8	22	48	39	5	13	101	< 10	41	24	130	427
45	0.7	73	12	90	7	15	< 5	22	35	14	< 7	34	58	7	< 3	92	10	48	35	37	785
46	2.0	66	10	86	8	< 10	13	15	32	19	29	16	85	10	4	72	14	67	39	54	591
47	4.8	90	15	91	9	27	14	12	35	18	48	612	93	12	5	71	11	80	38	846	369
48	1.8	77	15	67	< 5	27	6	7	37	15	31	64	51	8	3	72	12	61	38	85	527
49	3.3	77	17	84	10	23	9	6	32	16	63	41	63	8	< 2	68	15	111	62	138	414
50	2.3	52	6	69	5	< 10	11	5	35	18	15	16	74	7	4	83	8	51	33	41	498
51	2.3	89	7	112	8	< 10	15	12	27	19	34	14	85	12	< 2	57	7	84	33	64	472
52	1.8	88	13	96	8	15	14	12	60	19	42	16	88	10	< 2	53	12	85	36	76	402
53	1.3	70	10	89	< 5	< 10	8	16	28	16	21	13	46	8	3	50	12	83	31	45	638
54	2.0	61	19	105	11	19	15	12	48	19	49	31	102	13	4	79	14	92	45	82	455
55	2.0	77	16	149	7	21	13	8	58	19	50	20	83	11	3	61	10	78	32	85	536
56	2.3	69	21	132	6	17	15	5	38	19	45	27	78	10	< 2	64	11	67	33	94	601
57	2.0	74	17	116	< 5	20	15	17	54	20	45	28	84	12	< 2	63	13	77	34	91	607
58	2.0	66	7	138	7	15	16	12	54	22	40	24	88	12	2	62	9	79	35	76	503
59	3.1	99	16	131	< 5	< 10	13	9	58	20	38	11	89	11	< 2	65	15	73	35	86	548
60	2.6	74	13	115	6	17	16	8	51	19	41	20	108	12	< 2	82	13	79	38	107	479
61	2.0	78	15	128	6	11	13	16	57	21	29	21	89	13	2	63	11	80	40	76	565
62	2.3	83	11	79	6	13	10	6	43	17	32	13	73	8	10	65	10	59	35	46	560
63	2.0	96	13	104	10	15	12	13	67	19	35	17	90	11	< 2	61	13	70	39	61	669
64	2.8	67	14	140	< 5	22	15	12	49	19	48	42	91	13	2	59	10	82	34	99	552
65	1.8	89	11	93	6	13	9	17	41	17	18	28	44	4	< 2	44	10	46	28	132	749
66	1.8	82	6	85	< 5	14	8	9	24	18	21	13	59	6	12	52	6	59	27	43	657
67	9.9	74	18	491	8	266	18	3	44	17	73	75	116	16	4	69	14	113	33	380	269
68	3.1	74	23	119	14	23	22	10	45	21	67	26	136	18	< 2	68	14	116	40	108	292
69	2.3	60	17	72	7	< 10	8	19	49	18	24	14	75	8	3	76	9	54	38	81	606
70	2.8	66	14	110	7	14	13	13	32	21	29	19	83	11	4	82	11	66	36	90	601
71	3.1	73	15	113	7	18	16	6	46	18	45	21	94	15	3	87	12	130	39	122	345
72	2.8	73	22	107	11	19	19	9	41	18	41	62	112	12	11	63	16	88	34	113	382
73	3.3	62	17	139	8	23	15	13	45	19	34	36	93	12	3	72	11	85	33	83	500
75	4.8	88	< 5	94	10	15	18	6	43	21	15	26	114	16	< 2	85	14	109	39	62	431

m = missing data

U - sample															
Site	SiO_2 (%)	TiO_2 (%)	Al_2O_3 (%)	Fe_2O_3 (%)	MnO (%)	MgO (%)	CaO (%)	Na_2O (%)	K_2O (%)	P_2O_5 (%)	SO_3 (%)	LOI (%)	Org. C (%)	As ppm	Ba ppm
01	79.63	0.720	6.51	2.50	0.089	0.60	1.19	0.78	1.74	0.120	< 0.05	5.53	1.30	11	313
02	79.78	0.721	6.70	2.07	0.068	0.72	2.08	0.91	1.84	0.060	< 0.05	4.70	0.44	11	335
03	74.38	0.703	9.85	5.02	0.254	0.70	0.34	0.52	1.98	0.110	< 0.05	5.71	1.12	16	442
04	77.04	0.755	8.81	3.89	0.148	0.68	0.57	0.80	1.88	0.080	< 0.05	5.00	0.92	9	335
05	74.90	0.698	9.34	5.11	0.194	0.79	0.51	0.51	1.99	0.090	< 0.05	5.45	0.51	14	359
06	67.14	0.710	9.98	4.93	0.063	0.54	0.20	0.53	1.73	0.150	< 0.05	13.49	4.82	30	350
07	79.66	0.650	6.46	2.24	0.053	0.43	1.66	0.92	1.73	0.200	0.08	5.68	1.19	9	350
08	84.97	0.353	3.75	2.25	0.045	0.20	0.25	0.31	1.07	0.120	< 0.05	6.33	2.14	18	279
09	84.17	0.511	5.08	2.02	0.050	0.29	0.45	0.57	1.59	0.180	< 0.05	4.62	1.18	12	338
10	77.38	1.136	6.92	3.93	0.044	0.37	0.51	0.40	1.75	0.200	< 0.05	6.81	2.34	38	321
11	80.08	0.501	3.18	5.51	0.020	0.25	0.18	0.34	1.24	0.360	< 0.05	7.98	3.35	34	239
12	88.74	0.887	3.30	1.21	0.040	0.12	0.21	0.54	1.14	0.050	< 0.05	3.28	1.14	14	266
15	78.14	0.615	6.87	2.55	0.051	0.54	1.97	0.96	1.82	0.200	0.15	5.79	0.95	11	363
16	78.52	0.568	6.40	4.98	0.087	0.54	0.84	0.66	1.73	0.210	0.13	4.99	0.88	21	334
17	83.23	0.627	6.13	2.31	0.054	0.41	0.64	0.94	1.72	0.100	0.11	3.34	0.62	8	366
18	80.21	0.674	7.38	2.78	0.060	0.50	0.74	0.95	1.83	0.080	0.11	4.36	0.84	12	509
19	78.20	0.641	6.83	2.91	0.085	0.50	0.88	0.87	1.66	0.270	0.20	6.60	1.74	14	1302
21	70.11	0.380	5.14	9.13	0.108	0.36	1.22	0.47	1.46	0.480	0.24	10.60	3.04	22	312
22	89.90	0.379	3.03	2.27	0.083	0.14	0.19	0.38	1.02	0.040	0.09	2.20	0.29	20	283
23	73.59	0.513	5.22	6.98	0.039	0.60	0.75	0.47	1.69	0.810	0.11	8.64	2.43	33	383
24	68.71	0.543	7.24	4.51	0.047	0.77	4.18	0.65	1.82	0.460	2.06	8.46	1.68	40	360
25	70.71	0.537	7.81	4.34	0.073	0.72	2.09	0.68	1.65	0.440	0.31	9.88	1.85	55	904
26	81.19	0.696	6.88	2.40	0.059	0.45	0.70	1.01	1.76	0.090	0.16	4.30	0.97	16	338
27	82.56	0.492	5.88	2.22	0.091	0.29	0.52	0.83	1.50	0.160	0.14	4.95	1.29	19	339
28	74.57	0.483	6.11	3.00	0.078	0.64	4.05	0.69	1.61	0.200	0.24	7.82	1.20	30	344
29	80.72	0.673	6.07	3.89	0.089	0.52	0.57	0.72	1.52	0.090	0.16	4.67	0.71	19	309
30	77.89	0.720	8.01	3.18	0.087	0.59	0.57	0.94	1.89	0.170	0.11	5.45	1.11	22	371
32	80.36	0.649	5.94	2.39	0.035	0.46	1.54	0.83	1.65	0.200	0.18	5.29	1.04	17	317
33	79.92	0.672	6.55	2.12	0.049	0.41	2.47	0.97	1.65	0.090	0.16	4.65	0.33	12	310
34	79.03	0.548	6.98	3.20	0.078	0.54	0.76	0.79	1.53	0.090	0.14	6.05	1.08	15	307
37	81.96	0.519	4.57	1.70	0.028	0.27	0.41	0.68	1.26	0.320	0.18	7.67	2.82	12	278
38	78.20	0.577	7.31	4.02	0.081	0.52	0.69	0.80	1.55	0.400	0.05	5.53	0.56	21	362
39	57.12	0.598	11.25	3.87	0.061	0.83	4.24	0.62	1.87	0.440	0.38	18.26	3.78	68	798

m = missing data

U - sample

Site	SiO_2 (%)	TiO_2 (%)	Al_2O_3 (%)	Fe_2O_3 (%)	MnO (%)	MgO (%)	CaO (%)	Na_2O (%)	K_2O (%)	P_2O_5 (%)	SO_3 (%)	LOI (%)	Org. C (%)	As ppm	Ba ppm
42	83.92	0.482	4.80	1.99	0.032	0.31	0.45	0.66	1.37	0.300	0.07	5.25	1.60	9	296
43	71.49	0.556	9.30	4.08	0.076	0.88	1.61	0.64	1.78	0.090	0.15	8.89	1.37	12	315
44	79.86	0.481	3.99	1.73	0.042	0.59	3.91	0.53	1.07	0.100	0.18	7.15	1.26	6	255
45	75.21	0.710	8.19	3.31	0.067	0.67	1.17	0.81	1.85	0.160	0.18	7.28	1.46	9	352
46	77.02	0.718	8.12	2.96	0.077	0.62	0.70	0.83	1.77	0.134	0.04	6.75	2.02	7	323
47	72.28	0.693	8.47	5.89	0.202	0.75	0.74	0.56	1.50	0.162	0.06	8.38	2.29	16	632
48	72.44	0.634	6.41	7.23	0.110	0.64	1.66	0.66	1.43	0.261	0.13	8.08	2.28	11	283
49	77.97	0.689	6.48	2.81	0.064	0.51	2.01	0.78	1.62	0.117	0.11	6.52	1.61	9	299
50	79.63	0.605	5.98	2.12	0.053	0.47	1.28	0.76	1.53	0.202	0.13	6.96	2.43	10	317
51	73.10	0.899	10.36	4.39	0.128	1.06	0.28	0.67	1.67	0.141	0.03	7.01	1.48	9	319
52	77.04	0.627	7.46	3.65	0.131	0.68	0.46	0.33	1.32	0.174	0.03	7.87	2.43	20	278
53	78.44	0.650	5.56	4.65	0.110	0.36	1.27	0.38	1.30	0.245	0.13	6.58	1.67	40	281
54	73.47	0.738	8.93	3.82	0.134	0.92	0.83	0.71	1.65	0.162	0.12	8.20	2.70	14	315
55	70.66	0.893	11.17	5.07	0.132	1.02	0.27	0.68	1.79	0.137	0.04	7.89	1.88	11	367
56	71.74	0.740	9.63	4.52	0.186	0.74	0.65	0.60	1.72	0.186	0.06	8.91	2.79	12	337
57	70.79	0.800	10.61	4.69	0.180	0.96	0.40	0.63	1.84	0.199	0.06	8.56	2.63	10	352
58	72.81	0.983	9.16	3.60	0.114	0.84	0.28	0.57	1.61	0.158	0.03	9.59	3.54	12	315
59	69.01	0.793	11.53	4.45	0.137	1.11	0.31	0.73	2.00	0.137	0.03	9.48	2.75	16	376
60	68.96	0.815	11.80	5.45	0.419	0.64	0.34	0.68	2.22	0.135	0.03	8.22	2.35	26	514
61	71.52	0.833	10.75	4.23	0.130	0.65	0.31	0.51	2.01	0.154	0.03	8.58	2.66	16	393
62	78.51	0.547	5.28	2.65	0.078	1.09	1.99	0.24	1.31	0.193	0.16	7.56	2.00	9	258
63	71.71	0.755	9.71	4.05	0.190	1.32	0.92	0.44	2.28	0.182	0.12	8.04	2.34	10	401
64	71.38	0.757	10.85	4.63	0.240	0.90	0.34	0.58	1.94	0.161	0.03	7.93	2.35	17	432
65	78.27	0.936	5.58	6.87	0.067	1.01	0.96	0.21	1.23	0.252	0.06	4.24	1.29	5	240
66	81.16	0.430	3.98	2.73	0.063	0.57	1.71	0.20	0.95	0.275	0.19	7.49	2.15	10	229
67	67.07	0.858	12.47	4.83	0.161	1.16	0.47	0.75	2.17	0.245	0.03	9.46	3.05	14	417
68	66.71	0.772	12.77	5.22	0.467	1.19	0.26	0.70	2.18	0.177	0.03	9.29	2.51	9	430
69	78.66	0.777	7.56	2.62	0.065	0.54	0.95	0.84	2.08	0.110	0.09	5.37	1.44	7	359
70	68.62	0.845	11.36	5.15	0.409	0.74	0.35	0.53	2.08	0.174	0.02	9.42	2.84	33	486
71	59.50	0.547	8.12	13.16	0.126	0.61	3.10	0.44	1.47	0.689	0.27	11.34	2.76	40	419
72	67.40	0.752	11.20	5.75	0.230	1.25	1.12	0.46	2.15	0.168	0.12	9.01	2.07	15	445
73	66.02	0.786	11.65	5.25	0.157	0.86	0.51	0.44	2.13	0.267	0.08	11.27	3.76	20	1464
75	69.26	0.874	12.19	5.74	0.035	0.46	0.20	0.62	2.04	0.109	0.02	8.18	2.02	38	344

m = missing data

U - sample

Site	Cd ppm	Ce ppm	Co ppm	Cr ppm	Cs ppm	Cu ppm	Ga ppm	Hf ppm	La ppm	Nb ppm	Ni ppm	Pb ppm	Rb ppm	Sc ppm	Sn ppm	Sr ppm	Th ppm	V ppm	Y ppm	Zn ppm	Zr ppm
01	0.3	69	< 7	78	< 5	15	7	< 20	34	12	19	22	65	6	< 3	67	17	49	34	80	752
02	0.2	57	< 7	77	< 5	< 10	9	< 20	34	10	12	< 10	65	8	< 3	69	16	38	35	47	667
03	0.5	94	19	129	< 5	23	15	< 20	41	15	40	44	82	10	4	57	22	67	32	162	478
04	0.2	76	8	110	9	< 10	12	< 20	23	11	34	22	79	10	< 3	63	19	60	30	86	610
05	1.0	63	21	98	10	21	10	< 20	36	15	38	414	82	10	5	49	14	62	29	412	508
06	0.6	82	< 7	170	7	193	12	< 20	46	13	30	308	73	11	81	52	11	83	28	220	506
07	0.5	67	< 7	81	5	19	8	< 20	23	9	19	60	61	7	8	80	12	45	26	203	613
08	0.4	16	< 7	60	< 5	16	< 5	< 20	6	< 5	14	37	35	4	6	39	< 10	38	< 5	93	400
09	0.4	35	< 7	74	6	15	7	< 20	11	6	12	22	58	5	< 3	60	14	32	16	72	569
10	0.9	61	21	180	6	149	7	54	122	15	48	79	67	10	19	69	18	78	26	127	2160
11	0.8	41	< 7	107	< 5	13	< 5	< 20	17	7	< 7	41	50	4	< 3	42	< 10	50	19	66	1249
12	0.5	58	< 7	153	6	14	< 5	49	24	13	< 7	< 10	38	4	< 3	41	< 10	25	24	30	2396
15	0.7	50	12	76	< 5	25	6	< 20	36	13	13	57	65	7	4	92	< 10	46	33	102	583
16	0.7	55	11	82	< 5	12	< 5	< 20	30	8	13	19	63	7	< 3	74	< 10	58	24	38	577
17	1.1	44	8	79	5	10	6	< 20	26	14	< 7	34	60	6	< 3	77	< 10	38	30	322	677
18	0.9	77	10	91	7	19	5	< 20	37	10	11	32	66	9	< 3	87	< 10	51	27	51	613
19	1.1	73	13	94	6	47	6	24	29	11	16	106	65	7	12	102	11	59	31	150	630
21	3.0	50	15	66	5	< 10	6	28	30	9	< 7	44	48	7	< 3	102	< 10	52	18	398	330
22	0.2	< 15	< 7	55	< 5	< 10	< 5	22	7	7	< 7	13	32	4	< 3	40	< 10	20	13	< 7	710
23	6.8	67	13	149	5	176	< 5	25	29	11	17	144	59	6	19	72	< 10	66	30	874	900
24	9.6	42	12	199	6	80	8	21	19	10	31	127	68	8	5	147	10	65	24	525	454
25	6.6	57	15	156	9	239	9	< 20	31	11	35	723	72	9	34	110	< 10	71	30	1842	418
26	0.7	66	12	84	5	< 10	7	21	34	11	7	38	66	6	< 3	73	12	47	34	43	681
27	4.1	30	15	63	6	27	9	27	10	10	7	113	54	5	6	71	< 10	41	21	129	609
28	2.5	44	< 7	99	5	42	< 5	< 20	26	9	14	100	58	7	8	141	12	44	23	404	517
29	1.1	46	9	97	5	< 10	< 5	26	25	11	13	18	60	7	4	66	< 10	58	28	112	808
30	1.4	52	11	85	8	< 10	9	< 20	41	16	16	36	78	8	< 3	77	< 10	54	34	99	584
32	0.9	57	8	109	7	11	< 5	26	34	12	10	35	60	6	< 3	89	< 10	50	28	114	759
33	0.9	50	11	74	< 5	< 10	6	24	23	13	10	15	60	7	< 3	95	13	39	30	27	632
34	0.9	59	11	76	7	< 10	7	22	25	11	10	27	65	7	3	71	< 10	49	20	47	582
37	0.9	32	14	98	5	28	6	36	18	11	< 7	37	47	4	< 3	59	< 10	33	22	88	928
38	0.5	46	10	84	8	< 10	8	22	31	10	< 7	24	66	9	< 3	75	< 10	50	24	50	556
39	4.8	53	24	180	7	196	13	20	38	11	46	530	90	13	17	160	< 10	100	31	1305	342

m = missing data

U - sample

Site	Cd ppm	Ce ppm	Co ppm	Cr ppm	Cs ppm	Cu ppm	Ga ppm	Hf ppm	La ppm	Nb ppm	Ni ppm	Pb ppm	Rb ppm	Sc ppm	Sn ppm	Sr ppm	Th ppm	V ppm	Y ppm	Zn ppm	Zr ppm
42	0.9	35	8	73	< 5	25	< 5	21	20	7	< 7	36	46	6	5	62	< 10	41	21	115	535
43	1.1	39	14	82	8	14	11	21	21	10	19	36	84	11	3	97	< 10	73	26	69	309
44	0.9	49	9	72	< 5	13	< 5	< 20	24	7	17	31	32	6	< 3	80	< 10	31	24	94	653
45	1.4	59	13	82	7	19	7	10	34	12	22	45	79	10	3	87	<10	55	33	91	540
46	1.5	61	11	71	< 5	15	11	< 5	32	17	24	31	71	8	< 2	67	10	52	32	72	528
47	2.6	95	15	124	< 5	24	9	16	47	18	44	109	71	9	5	62	11	66	35	257	582
48	2.0	60	16	94	6	28	8	7	34	15	34	49	56	7	8	64	11	54	37	127	635
49	2.8	40	9	66	< 5	12	8	13	44	17	22	30	60	8	< 2	68	13	37	36	85	621
50	2.0	67	11	68	6	16	8	15	14	15	12	35	56	7	5	66	11	38	24	87	536
51	2.3	71	13	104	6	16	13	11	46	20	36	30	76	11	3	56	12	72	34	90	485
52	1.5	67	13	75	< 5	16	9	10	29	15	28	27	63	8	< 2	48	9	85	28	88	411
53	1.8	64	13	109	< 5	19	5	13	29	16	19	29	44	9	3	54	9	91	28	125	711
54	2.0	50	21	104	8	18	11	9	45	17	43	51	74	9	7	66	9	73	33	190	550
55	2.0	64	17	125	7	15	15	11	36	18	46	31	85	12	< 2	64	14	90	33	94	432
56	3.1	76	17	127	< 5	26	11	8	27	20	57	81	78	10	9	67	11	69	34	227	523
57	2.8	77	20	125	7	22	14	15	48	18	60	46	86	11	3	65	9	80	34	206	493
58	2.3	57	15	126	5	15	13	12	43	19	44	33	71	11	< 2	53	10	80	28	111	524
59	2.8	103	22	134	8	13	14	6	60	19	51	33	89	12	3	67	7	94	33	130	443
60	2.8	85	26	94	8	18	17	6	62	20	41	42	99	11	< 2	76	16	78	36	173	448
61	2.6	84	18	109	< 5	18	14	16	44	21	28	43	89	11	3	68	12	83	36	149	589
62	1.5	43	6	71	7	22	6	< 5	34	14	23	46	51	7	4	61	10	52	22	302	424
63	2.6	77	16	99	11	15	13	14	44	19	46	37	85	10	5	65	8	80	29	111	455
64	2.8	56	18	137	7	22	13	8	43	18	51	57	87	12	7	63	10	72	31	148	466
65	1.5	84	6	151	6	10	9	15	44	21	23	12	52	7	< 2	52	7	143	31	58	890
66	1.8	44	7	65	< 5	22	7	11	17	13	15	92	42	5	5	57	7	64	22	303	462
67	2.8	83	17	257	8	50	16	< 5	41	18	63	46	99	13	4	73	14	88	32	246	361
68	2.0	75	18	110	7	17	18	12	48	16	66	41	100	12	6	65	13	98	31	141	328
69	2.8	62	9	86	< 5	< 10	9	9	38	17	21	30	71	8	3	71	15	50	36	74	700
70	3.3	86	29	118	5	32	15	5	47	19	39	71	92	13	14	86	14	86	34	192	459
71	3.8	63	15	105	23	85	11	9	36	13	48	252	72	13	14	118	13	144	33	2048	342
72	4.8	90	19	111	7	27	13	12	47	17	37	119	94	13	3	63	10	81	33	331	457
73	4.3	93	17	866	9	112	15	11	51	19	48	189	99	13	41	92	11	108	36	310	455
75	3.6	61	8	84	9	26	17	10	37	19	18	42	94	13	< 2	76	14	77	38	57	551

m = missing data

S - sample

Site	SiO_2 (%)	TiO_2 (%)	Al_2O_3 (%)	Fe_2O_3 (%)	MnO (%)	MgO (%)	CaO (%)	Na_2O (%)	K_2O (%)	P_2O_5 (%)	SO_3 (%)	LOI (%)	Org. C (%)	As ppm	Ba ppm
01	81.40	0.687	5.59	2.02	0.089	0.42	1.63	0.80	1.52	0.200	0.09	5.19	1.32	8	304
02	79.99	0.587	5.12	1.36	0.024	0.65	3.25	0.71	1.68	0.080	0.12	6.10	1.13	4	298
03	71.06	0.757	9.30	4.73	0.455	0.71	0.58	0.82	1.74	0.200	0.16	8.92	2.70	16	486
04	75.49	0.700	8.39	3.79	0.124	0.82	0.83	0.64	1.70	0.130	0.12	6.82	1.78	10	331
05	47.39	0.532	8.36	3.24	0.058	1.31	3.23	0.47	1.37	1.070	0.89	31.61	16.00	8	548
06	48.31	0.440	7.99	4.11	0.051	0.96	2.65	0.33	1.11	1.610	1.00	30.75	2.79	23	608
07	81.50	0.637	5.71	1.84	0.039	0.39	1.80	0.89	1.63	0.240	0.16	4.87	1.10	6	344
08	78.59	0.386	3.93	3.79	0.129	0.26	1.28	0.49	1.21	1.010	0.37	8.04	3.26	9	372
09	82.06	0.543	5.34	2.30	0.041	0.38	1.00	0.61	1.58	0.340	0.24	5.26	1.40	12	348
10	88.00	0.618	3.06	2.84	0.021	0.14	0.25	0.45	1.17	0.220	< 0.05	2.64	0.55	22	266
11	83.49	0.481	2.83	5.19	0.023	0.16	0.24	0.34	1.17	0.420	< 0.05	5.16	1.92	28	262
12	86.81	0.683	3.46	1.28	0.037	0.14	0.29	0.73	1.20	0.140	0.06	4.63	1.96	13	285
15	75.32	0.647	6.53	2.57	0.039	0.56	2.51	0.78	1.71	0.320	0.79	7.95	2.80	8	374
16	76.37	0.567	5.64	6.43	0.118	0.48	1.14	0.59	1.61	0.350	0.21	5.92	1.87	9	352
17	83.43	0.618	5.83	2.10	0.045	0.44	0.94	0.89	1.72	0.130	0.16	3.27	0.81	6	392
18	79.56	0.599	6.32	2.41	0.044	0.57	1.46	0.95	1.72	0.230	0.24	5.52	1.63	6	398
19	78.83	0.638	6.88	2.64	0.064	0.57	1.30	1.02	1.82	0.230	0.21	5.38	1.54	8	389
21	87.22	0.243	2.98	3.51	0.018	0.15	0.32	0.40	1.14	0.460	0.12	3.19	0.78	13	263
22	85.11	0.368	3.52	2.25	0.029	0.18	0.39	0.44	1.06	0.540	0.10	5.68	2.69	20	273
23	45.70	0.439	7.00	7.16	0.038	0.71	4.26	0.40	1.24	1.350	2.57	28.41	10.33	26	477
24	67.66	0.629	8.46	4.75	0.091	0.87	2.47	0.74	1.90	0.500	0.80	10.79	3.15	19	358
25	70.67	0.580	6.34	3.11	0.041	0.93	3.83	0.71	1.57	0.520	0.58	10.49	3.72	24	503
26	78.85	0.693	7.75	3.07	0.096	0.57	0.70	0.96	1.90	0.140	0.19	4.77	1.03	5	343
27	85.02	0.526	4.96	1.76	0.044	0.27	0.61	0.75	1.43	0.220	0.22	3.78	1.44	8	302
28	59.80	0.547	7.59	5.24	0.115	1.01	6.27	0.67	1.77	1.250	1.07	14.05	3.79	39	395
29	78.94	0.620	6.42	2.86	0.052	0.50	1.01	0.81	1.69	0.360	0.31	5.78	1.56	11	335
30	73.76	0.561	6.78	3.03	0.059	0.63	2.76	0.88	1.65	0.290	0.67	8.45	2.30	24	375
32	77.69	0.545	5.71	2.21	0.034	0.45	3.03	0.85	1.59	0.340	0.53	6.60	1.72	10	325
33	68.16	0.516	5.95	2.48	0.070	0.50	5.60	0.66	1.42	0.250	0.83	13.24	3.83	11	289
34	m	m	m	m	m	m	m	m	m	m	m	m	m	m	m
37	84.69	0.592	4.41	1.63	0.026	0.29	0.60	0.89	1.28	0.150	0.15	4.89	2.49	8	272
38	79.26	0.528	5.29	1.93	0.037	0.40	2.44	0.73	1.37	0.500	0.39	6.60	2.14	11	320
39	79.20	0.520	5.73	2.23	0.059	0.42	2.59	0.63	1.40	0.150	0.23	6.37	0.97	23	458

m = missing data

S - sample

Site	SiO_2 (%)	TiO_2 (%)	Al_2O_3 (%)	Fe_2O_3 (%)	MnO (%)	MgO (%)	CaO (%)	Na_2O (%)	K_2O (%)	P_2O_5 (%)	SO_3 (%)	LOI (%)	Org. C (%)	As ppm	Ba ppm
42	86.82	0.407	3.99	1.48	0.020	0.22	0.61	0.58	1.29	0.230	0.19	3.77	1.61	4	293
43	73.76	0.452	7.14	2.94	0.048	0.65	2.88	0.80	1.70	0.410	0.41	8.59	1.83	8	311
44	76.70	0.567	5.77	2.23	0.055	0.65	3.53	0.76	1.46	0.180	0.23	7.67	1.49	7	291
45	63.43	0.643	8.82	4.34	0.058	0.74	2.76	0.72	1.79	0.850	1.35	14.09	5.61	9	538
46	72.39	0.744	8.12	3.21	0.112	0.77	2.71	0.80	1.78	0.190	0.15	8.61	1.63	5	368
47	59.44	0.694	10.18	5.20	0.175	0.88	3.53	0.52	1.86	0.337	0.35	16.41	5.74	17	443
48	71.13	0.659	6.34	7.80	0.121	0.70	2.66	0.66	1.39	0.284	0.19	7.70	1.73	10	291
49	77.51	0.585	4.95	2.29	0.053	0.53	4.25	0.61	1.40	0.124	0.12	7.16	1.34	5	259
50	m	m	m	m	m	m	m	m	m	m	m	m	m	m	m
51	69.81	0.995	9.78	4.37	0.130	1.22	0.91	0.70	1.68	0.226	0.20	9.69	2.61	6	315
52	81.00	0.573	6.06	3.09	0.106	0.59	0.66	0.26	1.18	0.155	0.15	5.92	1.50	13	238
53	m	m	m	m	m	m	m	m	m	m	m	m	m	m	m
54	74.30	0.770	9.69	3.65	0.083	0.92	0.70	0.80	1.80	0.123	0.15	6.74	1.90	8	332
55	68.63	0.877	9.99	4.10	0.111	0.95	0.51	0.54	1.72	0.235	0.09	11.96	4.36	23	371
56	72.97	0.722	9.02	4.28	0.144	0.78	1.10	0.53	1.62	0.218	0.18	8.10	2.33	11	362
57	73.93	0.840	9.95	4.42	0.139	0.91	0.36	0.76	1.73	0.169	0.04	6.47	1.62	15	326
58	74.58	1.000	9.21	3.34	0.109	0.86	0.35	0.54	1.67	0.161	0.03	7.89	2.78	12	325
59	76.76	0.905	8.98	3.34	0.093	0.94	0.35	0.82	1.64	0.135	0.05	5.74	1.80	11	300
60	64.76	0.775	12.57	6.44	0.797	0.76	0.49	0.60	2.39	0.192	0.07	9.80	3.09	28	591
61	67.18	0.758	10.27	4.49	0.173	0.76	0.47	0.44	1.90	0.325	0.05	12.86	4.84	21	408
62	71.28	0.642	7.06	3.19	0.107	1.67	2.28	0.28	1.72	0.291	0.30	10.84	3.03	10	304
63	79.11	0.717	7.51	3.13	0.131	1.13	0.78	0.35	1.97	0.117	0.09	4.69	1.02	7	328
64	66.24	0.795	11.83	4.97	0.221	1.26	1.09	0.56	2.23	0.209	0.17	10.13	2.73	11	475
65	75.97	0.896	5.82	2.85	0.123	1.21	2.19	0.26	1.29	0.191	0.20	8.56	2.38	7	238
66	86.90	0.519	3.17	2.14	0.039	0.62	1.57	0.20	0.83	0.128	0.17	3.38	0.50	6	177
67	65.31	0.823	12.68	4.93	0.171	1.23	0.76	0.71	2.22	0.300	0.12	10.37	3.36	13	698
68	66.77	0.795	13.00	5.81	0.363	1.29	0.32	0.72	2.23	0.182	0.03	8.20	1.99	12	432
69	80.86	0.583	5.92	1.63	0.028	0.54	2.02	0.64	2.13	0.124	0.13	5.03	1.15	3	365
70	75.82	0.823	8.97	3.92	0.398	0.62	0.38	0.49	1.65	0.174	0.03	6.44	1.96	21	376
71	60.79	0.504	6.88	13.64	0.120	0.55	3.98	0.39	1.32	0.763	0.51	10.10	2.20	42	380
72	69.89	0.699	9.98	4.99	0.136	0.93	0.98	0.55	1.84	0.206	0.20	9.21	2.84	15	444
73	m	m	m	m	m	m	m	m	m	m	m	m	m	m	m
75	69.69	0.832	11.75	5.29	0.025	0.50	0.20	0.61	2.06	0.124	0.03	8.62	3.44	46	340

m = missing data

S - sample

Site	Cd ppm	Ce ppm	Co ppm	Cr ppm	Cs ppm	Cu ppm	Ga ppm	Hf ppm	La ppm	Nb ppm	Ni ppm	Pb ppm	Rb ppm	Sc ppm	Sn ppm	Sr ppm	Th ppm	V ppm	Y ppm	Zn ppm	Zr ppm
01	0.2	67	< 7	78	< 5	14	5	< 20	27	9	9	26	51	6	< 3	68	17	34	25	106	739
02	0.2	48	< 7	59	< 5	12	< 5	< 20	34	9	10	27	53	5	5	68	13	30	29	88	612
03	1.4	108	28	433	< 5	47	10	< 20	61	14	53	68	75	10	11	69	27	67	34	376	685
04	0.6	58	14	172	5	12	9	< 20	40	13	91	77	63	9	8	57	11	58	34	197	596
05	7.2	58	14	175	6	194	12	< 20	25	7	49	342	53	8	70	79	< 10	49	28	1653	279
06	4.5	60	17	124	6	320	7	< 20	23	8	102	527	47	7	152	64	11	120	20	1429	256
07	0.3	45	< 7	82	< 5	23	< 5	< 20	33	12	14	26	55	7	8	78	11	38	20	177	731
08	1.7	28	11	1204	5	111	6	< 20	22	6	347	180	38	4	13	81	10	33	11	650	417
09	0.4	46	< 7	81	6	24	7	23	20	8	< 7	23	59	5	< 3	66	< 10	41	28	149	656
10	0.2	40	< 7	96	5	15	5	27	19	12	10	174	39	3	< 3	47	14	31	18	149	1327
11	1.4	38	< 7	93	< 5	12	6	39	25	7	9	33	39	4	7	43	< 10	43	19	221	1465
12	0.4	35	< 7	124	< 5	11	< 5	52	17	12	10	19	37	4	4	50	13	26	23	124	1781
15	1.1	61	12	96	< 5	28	8	24	29	11	16	111	63	7	4	111	11	45	33	210	751
16	2.3	67	10	80	7	< 10	7	27	28	12	7	21	61	7	< 3	71	< 10	60	28	33	666
17	0.7	42	10	83	6	< 10	< 5	< 20	30	13	12	56	59	6	< 3	81	< 10	38	26	65	739
18	1.1	50	8	79	7	27	< 5	< 20	23	12	11	50	62	6	3	92	< 10	49	26	110	604
19	0.9	70	13	120	6	28	10	27	34	11	25	67	65	7	< 3	85	< 10	49	30	145	594
21	0.5	19	11	31	< 5	< 10	< 5	< 20	13	7	< 7	16	36	2	< 3	50	< 10	25	12	131	302
22	0.5	38	11	46	< 5	19	< 5	24	17	8	7	27	34	4	< 3	50	< 10	28	17	187	638
23	5.0	50	18	170	5	459	6	< 20	25	10	64	405	50	6	31	231	< 10	96	19	1673	313
24	2.3	68	12	98	6	56	10	21	19	13	20	64	82	9	4	107	11	64	25	293	482
25	4.6	51	34	121	7	154	6	< 20	28	8	43	511	56	7	21	122	< 10	63	27	951	514
26	0.9	45	9	77	7	< 10	7	< 20	41	14	18	22	70	8	< 3	75	< 10	63	31	39	569
27	1.1	46	< 7	75	< 5	16	< 5	30	20	11	< 7	36	50	4	< 3	72	< 10	37	21	86	968
28	6.8	49	10	188	7	118	9	26	38	11	36	144	71	10	11	240	10	71	30	631	387
29	5.0	43	13	84	6	20	< 5	< 20	36	11	17	62	61	7	5	79	< 10	52	30	825	669
30	3.9	48	13	101	6	36	6	29	31	11	15	120	64	7	7	85	11	55	25	779	488
32	1.4	38	8	135	7	34	< 5	22	8	9	16	50	52	7	< 3	167	< 10	39	23	199	554
33	4.1	43	13	85	5	52	7	< 20	23	9	19	79	56	7	3	125	< 10	44	24	350	433
34	m	m	m	m	m	m	m	m	m	m	m	m	m	m	m	m	m	m	m	m	m
37	0.5	44	< 7	107	6	< 10	< 5	33	22	12	< 7	37	42	4	3	63	< 10	38	24	117	1316
38	0.9	48	15	101	5	38	5	29	17	10	16	50	46	6	6	108	< 10	35	22	351	744
39	1.8	45	16	111	5	31	7	23	24	7	11	137	55	7	9	98	< 10	37	20	290	696

m = missing data

S - sample

Site	Cd ppm	Ce ppm	Co ppm	Cr ppm	Cs ppm	Cu ppm	Ga ppm	Hf ppm	La ppm	Nb ppm	Ni ppm	Pb ppm	Rb ppm	Sc ppm	Sn ppm	Sr ppm	Th ppm	V ppm	Y ppm	Zn ppm	Zr ppm
42	0.9	39	10	64	< 5	23	< 5	21	7	9	< 7	34	43	4	3	68	< 10	32	13	176	526
43	1.4	42	10	61	6	21	7	10	19	8	11	31	67	8	< 3	117	< 10	51	19	94	307
44	1.1	50	< 7	73	6	18	< 5	10	23	10	14	36	51	7	< 3	90	< 10	39	30	106	593
45	2.3	70	13	116	9	74	13	32	43	14	39	168	73	9	10	144	12	72	29	771	492
46	2.3	55	11	78	6	15	9	9	43	18	28	26	72	7	11	76	12	52	36	103	638
47	3.1	54	23	95	8	28	11	< 5	44	17	45	102	83	12	7	89	14	78	32	297	381
48	2.0	68	12	93	5	31	9	15	37	18	32	58	55	8	9	70	11	64	40	153	703
49	1.8	51	7	61	< 5	< 10	7	18	22	18	11	30	45	5	4	66	12	33	29	68	684
50	m	m	m	m	m	m	m	m	m	m	m	m	m	m	m	m	m	m	m	m	m
51	2.6	66	12	114	8	15	13	17	56	19	43	37	81	12	10	64	10	70	30	158	496
52	2.0	71	13	72	6	< 10	8	< 5	24	14	26	15	53	7	< 3	44	6	50	24	93	469
53	m	m	m	m	m	m	m	m	m	m	m	m	m	m	m	m	m	m	m	m	m
54	2.3	54	18	99	6	16	11	< 5	37	18	34	35	79	10	4	67	15	62	34	112	509
55	2.3	73	19	117	8	20	12	< 5	44	17	48	39	80	10	4	69	10	73	37	233	431
56	2.8	66	18	141	6	33	11	10	51	16	52	88	76	10	21	69	10	69	34	256	610
57	2.8	74	18	138	8	19	14	9	48	18	52	42	78	10	2	63	13	81	33	153	580
58	3.3	59	18	132	10	15	12	10	47	21	50	28	74	11	4	57	8	72	31	147	573
59	2.8	71	11	103	6	16	11	15	48	20	48	23	68	9	5	64	10	67	33	125	603
60	6.4	94	49	84	10	30	18	< 5	51	18	74	43	105	11	5	84	14	89	38	349	367
61	4.8	79	32	124	< 5	31	14	6	41	19	47	44	82	12	< 2	64	12	70	35	316	496
62	2.3	51	11	86	8	34	11	10	46	14	28	38	67	9	< 2	79	10	58	26	241	538
63	2.0	108	9	96	8	11	12	< 5	53	15	37	25	70	8	5	57	12	56	28	76	517
64	3.1	69	21	128	6	28	18	9	45	19	64	64	94	11	5	83	14	87	30	176	327
65	1.5	84	12	103	9	23	9	18	51	17	32	63	54	8	6	78	10	55	32	573	768
66	1.3	57	3	64	6	15	< 5	12	27	14	16	25	34	5	2	54	9	43	22	141	744
67	4.3	94	16	280	8	57	16	8	43	17	79	48	100	15	2	81	11	95	33	335	326
68	2.0	68	20	112	6	25	17	< 5	38	17	69	38	104	12	6	68	14	89	32	179	332
69	2.3	48	3	64	5	< 10	7	15	27	18	13	27	58	5	< 2	66	10	28	25	94	647
70	3.1	49	22	114	7	26	13	10	30	18	34	49	68	10	10	76	7	66	37	202	537
71	3.6	52	15	106	18	46	7	6	28	13	44	104	61	12	14	127	10	118	32	818	444
72	7.1	133	21	112	7	48	13	7	79	17	40	263	80	10	13	65	10	69	35	522	496
73	m	m	m	m	m	m	m	m	m	m	m	m	m	m	m	m	m	m	m	m	m
75	3.8	71	3	83	6	22	15	11	58	20	22	41	92	13	4	74	14	90	37	56	543

m = missing data

Elements with concentrations below detection limits and/or missing data in more than 50% of the samples

	L - sample								U - sample								S - sample							
Site	Cl	F	Bi	Mo	Sb	Ta	U	W	Cl	F	Bi	Mo	Sb	Ta	U	W	Cl	F	Bi	Mo	Sb	Ta	U	W
	%	%	ppm	ppm	ppm	ppm	ppm	ppm	%	%	ppm	ppm	ppm	ppm	ppm	ppm	%	%	ppm	ppm	ppm	ppm	ppm	ppm
01	m	m	m	<5	m	<10	<7	<10	m	m	m	7	m	<10	<7	<10	m	m	m	7	m	<10	<7	<10
02	m	m	m	<5	m	<10	<7	<10	m	m	m	<5	m	<10	<7	<10	m	m	m	<5	m	<10	<7	<10
03	m	m	m	<5	m	<10	<7	<10	m	m	m	5	m	<10	<7	<10	m	m	m	7	m	<10	<7	11
04	m	m	m	<5	m	<10	<7	<10	m	m	m	<5	m	<10	<7	<10	m	m	m	11	m	<10	<7	<10
05	m	m	m	<5	m	<10	<7	<10	m	m	m	6	m	<10	<7	<10	m	m	m	<5	m	<10	<7	<10
06	m	m	m	m	m	m	m	m	m	m	m	5	m	<10	<7	<10	m	m	m	<5	m	<10	<7	11
07	m	m	m	<5	m	<10	<7	11	m	m	m	<5	m	<10	<7	<10	m	m	m	<5	m	<10	<7	11
08	m	m	m	<5	m	<10	<7	<10	m	m	m	<5	m	<10	<7	<10	m	m	m	29	m	<10	<7	<10
09	m	m	m	17	m	<10	<7	<10	m	m	m	<5	m	<10	<7	<10	m	m	m	<5	m	<10	<7	<10
10	m	m	m	33	m	<10	<7	11	m	m	m	5	m	<10	<7	<10	m	m	m	<5	m	<10	<7	<10
11	m	m	m	<5	m	<10	<7	<10	m	m	m	<5	m	<10	<7	<10	m	m	m	6	m	<10	<7	<10
12	m	m	m	9	m	<10	<7	<10	m	m	m	10	m	<10	<7	<10	m	m	m	10	m	<10	<7	<10
15	m	m	m	<5	m	<10	<7	<10	m	m	m	<5	m	<10	<7	13	m	m	m	<5	m	<10	<7	<10
16	m	m	m	<5	m	<10	<7	<10	m	m	m	<5	m	<10	<7	<10	m	m	m	<5	m	<10	<7	<10
17	m	m	m	<5	m	<10	<7	<10	m	m	m	<5	m	<10	<7	14	m	m	m	<5	m	<10	<7	<10
18	m	m	m	<5	m	<10	<7	13	m	m	m	<5	m	<10	<7	16	m	m	m	<5	m	<10	<7	<10
19	m	m	m	<5	m	<10	<7	15	m	m	m	<5	m	11	<7	10	m	m	m	<5	m	<10	<7	12
21	m	m	m	<5	m	<10	<7	11	m	m	m	<5	m	<10	<7	<10	m	m	m	<5	m	<10	<7	<10
22	m	m	m	<5	m	<10	<7	11	m	m	m	<5	m	<10	<7	<10	m	m	m	<5	m	<10	<7	<10
23	m	m	m	<5	m	<10	<7	12	m	m	m	<5	m	<10	<7	<10	m	m	m	7	m	<10	<7	13
24	m	m	m	<5	m	<10	<7	<10	m	m	m	<5	m	<10	<7	<10	m	m	m	<5	m	<10	<7	<10
25	m	m	m	<5	m	<10	<7	<10	m	m	m	<5	m	<10	<7	<10	m	m	m	<5	m	<10	<7	17
26	m	m	m	<5	m	<10	<7	14	m	m	m	<5	m	<10	<7	<10	m	m	m	<5	m	<10	<7	<10
27	m	m	m	<5	m	<10	<7	<10	m	m	m	<5	m	<10	<7	<10	m	m	m	<5	m	<10	<7	<10
28	m	m	m	<5	m	<10	<7	10	m	m	m	<5	m	<10	<7	17	m	m	m	<5	m	<10	<7	<10
29	m	m	m	<5	m	<10	<7	12	m	m	m	<5	m	<10	<7	<10	m	m	m	<5	m	<10	<7	<10
30	m	m	m	<5	m	<10	<7	13	m	m	m	<5	m	<10	<7	14	m	m	m	<5	m	<10	<7	<10
32	m	m	m	<5	m	<10	<7	11	m	m	m	<5	m	<10	<7	<10	m	m	m	<5	m	<10	<7	11
33	m	m	m	<5	m	<10	<7	12	m	m	m	<5	m	<10	<7	11	m	m	m	m	m	m	m	m
34	m	m	m	<5	m	<10	<7	11	m	m	m	<5	m	<10	<7	12	m	m	m	<5	m	<10	<7	<10
37	m	m	m	<5	m	12	<7	<10	m	m	m	<5	m	<10	<7	13	m	m	m	<5	m	<10	<7	<10
38	m	m	m	<5	m	<10	<7	<10	m	m	m	<5	m	<10	<7	<10	m	m	m	<5	m	<10	<7	11
39	m	m	m	<5	m	<10	<7	10	m	m	m	<5	m	<10	<7	<10	m	m	m	<5	m	<10	<7	<10

m = missing data

Elements with concentrations below detection limits and/or missing data in more than 50% of the samples																								
	L - sample								U - sample								S - sample							
Site	Cl	F	Bi	Mo	Sb	Ta	U	W	Cl	F	Bi	Mo	Sb	Ta	U	W	Cl	F	Bi	Mo	Sb	Ta	U	W
	%	%	ppm	ppm	ppm	ppm	ppm	ppm	%	%	ppm	ppm	ppm	ppm	ppm	ppm	%	%	ppm	ppm	ppm	ppm	ppm	ppm
42	m	m	m	<5	m	<10	<7	<10	m	m	m	<5	m	<10	<7	<10	m	m	m	<5	m	<10	<7	<10
43	m	m	m	<5	m	<10	<7	<10	m	m	m	<5	m	<10	<7	11	m	m	m	<5	m	<10	<7	<10
44	m	m	m	<5	m	<10	<7	12	m	m	m	<5	m	<10	<7	10	m	m	m	<5	m	<10	<7	13
45	m	m	m	<5	m	<10	<7	13	m	m	m	<5	m	<10	<7	15	m	m	m	<5	m	<10	<7	10
46	0.01	< 0.02	<5	<3	8	<5	4	5	0.01	< 0.02	<5	<3	9	7	<3	<5	0.01	< 0.02	<5	3	<5	<5	5	<5
47	0.01	< 0.02	<5	<3	12	<5	6	6	0.01	< 0.02	<5	<3	<5	8	<3	<5	0.01	< 0.02	7	<3	13	<5	3	<5
48	0.01	0.27	<5	4	<5	<5	<3	<5	0.01	< 0.02	<5	<3	9	<5	<3	<5	0.02	< 0.02	<5	<3	14	<5	<3	<5
49	0.01	0.04	<5	<3	<5	9	7	<5	0.01	< 0.02	<5	<3	5	<5	4	<5	0.01	< 0.02	<5	<3	<5	<5	<3	<5
50	0.01	< 0.02	<5	<3	9	6	4	<5	0.01	< 0.02	<5	<3	<5	<5	4	<5	m	m	m	m	m	m	m	m
51	0.01	< 0.02	<5	<3	<5	<5	<3	<5	0.01	< 0.02	<5	<3	10	<5	4	6	0.02	< 0.02	<5	<3	<5	<5	<3	<5
52	0.01	< 0.02	<5	<3	<5	<5	3	5	0.01	< 0.02	<5	<3	11	<5	3	<5	0.01	< 0.02	<5	<3	<5	<5	3	<5
53	0.01	< 0.02	<5	<3	16	<5	<3	<5	0.02	< 0.02	<5	<3	6	9	6	<5	m	m	m	m	m	m	m	m
54	0.01	< 0.02	<5	<3	7	5	3	<5	0.01	< 0.02	<5	<3	11	<5	<3	<5	0.02	< 0.02	<5	<3	<5	<5	<3	<5
55	0.03	< 0.02	<5	<3	<5	7	4	7	0.02	< 0.02	<5	<3	<5	<5	5	<5	0.02	< 0.02	<5	3	6	<5	5	<5
56	0.01	< 0.02	<5	<3	<5	<5	<3	<5	0.02	< 0.02	<5	<3	7	6	<3	<5	0.01	< 0.02	<5	<3	5	<5	5	<5
57	0.03	< 0.02	<5	<3	<5	<5	5	<5	0.01	< 0.02	<5	<3	<5	<5	<3	<5	0.02	< 0.02	<5	<3	<5	<5	3	<5
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75	0.01	< 0.02	6	3	5	9	6	<5	0.01	< 0.02	<5	5	7	<5	4	6	0.01	< 0.02	<5	5	7	9	4	<5

m = missing data