Guidelines for Sampling and Sample-Treatment

Soil

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Contents

1 Federal Environmental Specimen Bank

The German Environmental-Specimen Bank (ESB) is an instrument of environmental monitoring for the Federal Environment Ministry underlying specialized and administrative co-coordination of the Federal Environment Agency (Umweltbundesamt, UBA). The ESB collects ecologically representative environmental specimen in addition to human samples, and maintains and examines them concerning relevant environmental substances (UBA 2014).

The long-term storage takes place under conditions which preclude to the greatest possible extent any change in state or chemical characteristics over a period of several decades. Thus, the archive is able to provide samples for the retrospective examination of substances whose potential risk to the environment and human health is as yet unknown.

Detailed information on the UPB is available under www.umweltprobenbank.de.

2 Guideline Objective

Sampling is the first and most important step in ensuring the quality of the sample and the data. It is carried out using scientifically founded standardised methods to minimise contamination and avoid the loss of chemical information.

The high demands of quality assurance reflect the extreme importance of the samples as archive material. Representativity and reproducibility are crucial for the comparison of test results in time and space.

These guidelines represent a further development of the Weinfurtner & Kördel edition (2012).

The transport, subsequent processing, storage and chemical characterisation must take place in compliance with the currently valid UPB guidelines.

3 Function of sample type

Soils are among the most important structural and functional elements of terrestrial ecosystems. They form the interface between atmosphere, pedosphere and biosphere. They are a source and (depending on substance and soil characteristics) a medium of accumulation and preservation of all substances carried by the atmosphere or applied directly. The substances thus introduced are transported, transformed and/or accumulated in the soil. Substances precipitated on the vegetation by dry deposition or combing effects (which are extremely difficult to detect) enter the soil through litterfall. Since soils are the essential subsistence basis for all types of terrestrial sample, they represent an necessary source of information supplementing animal and vegetable samples.

Besides their natural background levels and ongoing immissions, soils represent (up to the time of sampling) all the extraneous substances accumulated over long periods of time and which have not yet decomposed under existing conditions. These include heavy metals combined with mineral and/or organic sorption materials as well as organic compounds ("bound residues", e.g. polycyclic aromatic carbohydrates [PAC]). However, their overall concentrations or analytically detectable fractions have little validity with regard to their present or future ecotoxicological effects. Soil analyses can only describe pollution levels realistically when all the ecotoxicologically relevant substances are preserved in their existing chemical state up to the point of analysis, and can be determined qualitatively and quantitatively as such.

This requirement is not fulfilled by any of the existing standards (e.g. DIN ISO 10381, Paetz et al. 1994, Önorm L 1055-1059, 2004). For this reason, the UPB requires a re-defined process for taking and treating soil samples which takes all the existing regulations into account.

The limited capacity of the sample archive require a very restrictive definition of the soil samples to be taken by the UPB. Since it is impossible to differentiate with regard to horizon, layer and/or depth, and to store entire soil profiles, closely defined site-related sampling of the cover horizons and a reduced number of mineral-soil horizons is carried out. The humus cover and the mineral soil are not mixed because of the widely differing organic and mineralogical composition of the horizons.

Some of the principles of this sampling strategy deviate substantially from the regulations and sampling guidelines of other programs. However, for the requirements of the UPB (e.g. documentation of all known and unknown substances in the soil in their present concentration) they represent a compromise (Aichberger et al. 1986, BDF 1991, BMELF 1990, Cline 1944, Fortunati et al. 1994, Fränzle 1994, Müller et al. 1980, Smith et al. 1987).

With regard to the preparation, execution and assessment of results, cooperation with other research and monitoring programs (e.g. BDF, BZE, Integrated Monitoring) is encouraged.

4 Regulations for sampling

The exact definition of the sampling sites (PNF) within the sections of the sampling region (GA) is in two steps:

1.) scientific characterisation of the soil in the area
2.) Selection and delimitation of the sampling sites.

For these operations at least one person with sufficient scientific knowledge (e.g. experienced pedologist) is required.

4.1 Pedological characterisation of area

Soils are an important factor in interpreting the results of the analysis of other types of samples in a particular location. For this reason, a pedological characterisation of the area is indispensible.

This area characterisation is carried out in the following stages:

- Analysis of scientific literature, map and data material concerning geological and pedological features;
- Contact with responsible authorities and institutions to obtain permission for access and utilisation.
  Pedological mapping of the area section and definition of the principle type of soil.

The criteria of homogeneity for the sampling region to be studied are defined on the basis of the characterisation of the area.

The preliminary pedological and ecological characterisation of samples and area must take account of subsoil horizons down to the initial substrate involved in soil formation (generally to a depth of approx. 1,5 metres).

The pedological characterisation of the area is done by boring-rod mapping using standard field practice. During examination, it is important that no excess boring material is deposited on the surface of the potential sampling site. The collection of data is based on the pedological mapping instructions no. 5 abbreviated to KA 5 - (AG Bodenkunde, 2005). The following minimum parameters should be documented:

- Soil type and humus form
- Soil description (fine soil)
- Soil colour
- Hydromorphological characteristics (Fe- and Mn concretions)
- Horizon thickness.

4.2 Selection and delimitation of sampling sites

Wherever possible, the sampling site must be located in the same sampling region from which the terrestrial sample types of the UPB (e.g. spruce and pine) are located. The site must be clearly defined by mapping and be of sufficient pedological homogeneity. It must (as far as possible) represent the dominating soil type in the form typical of the sampling region (main soil type). The following types of map must be consulted:

- topographical maps (1:5.000 to 1:10.000)
- soil-concept maps
- soil-type maps
- forestry maps (1:10.000)
- site mapping
- geomorphological maps

- geological maps
- vegetation maps
- land-use plans etc.

The site must be large enough to allow sustainable repetition of sampling. It should be less than 2500 m^2 in size only in exceptional cases (e.g. in urbanised areas). If this is not possible, additional sampling sites must used which are in the vicinity of the terrestrial sample types.

Moreover, sufficient sites must be available which can be used for emergency backup, e.g. in a spruce forest where clearings have been created by through damage by gales or bark beetles. Before final delimitation by means of boring-rod marking, the uniformity of the pedological conditions in the sampling site must first be verified. This verification must take account of factors such as initial material and soil type, site topography, slope and direction, utilisation, vegetation as well as any parts of the site which have been disturbed. The mapping must indicate the homogeneous soil units in detail (Blume 2004, Burgess et al. 1984, Mückenhausen 1977, Wilding 1985).

The following parameters must be recorded to determine the soil units:

- soil type and humus form
- soil description (fine soil and skeletal content)
- soil colour
- horizon thicknesses and characteristics
- soil reaction.

Based on the mapping results, the sampling site is then determined and described in the area-related sampling plan (section 4.6).

The site must be durably but unobtrusively marked in the terrain.

In the immediate vicinity of the sampling site, a lead soil profile should be excavated and evaluated in accordance with pedological mapping instructions. It should then be sampled horizon by horizon. The data resulting from the examination of the lead profile, should then be documented in form of type KA 5 (AG Bodenkunde 2005). The following laboratory-analysis data should then be added to the data obtained from the profile study:

- water-retention capacity (WHK)
- dry volumetric density (TRD) or soil density
- texture (sand / silt / clay)
- pH value
- C_{total} /N_{total}
- $C_{carbonate}$
- CEC_{eff} /exchangeable cations
- sesquioxides (Fe/Al/Mn) in hyposulphite extract
- clay-mineral analysis
- trace metals in aqua regia extract (As, Cd, Co, Cr, Cu, Fe, Hg, Ni, Pb, Zn) and NH_4NO_3 extract (Cd, Co, Cr, Cu, Fe, Ni, Pb, Zn).

The profile ditch must be at a distance of at least 4 metres from the actual sampling site. The excavated material must be stored by horizon on tarpaulins and then replaced in the ditch horizon by horizon.

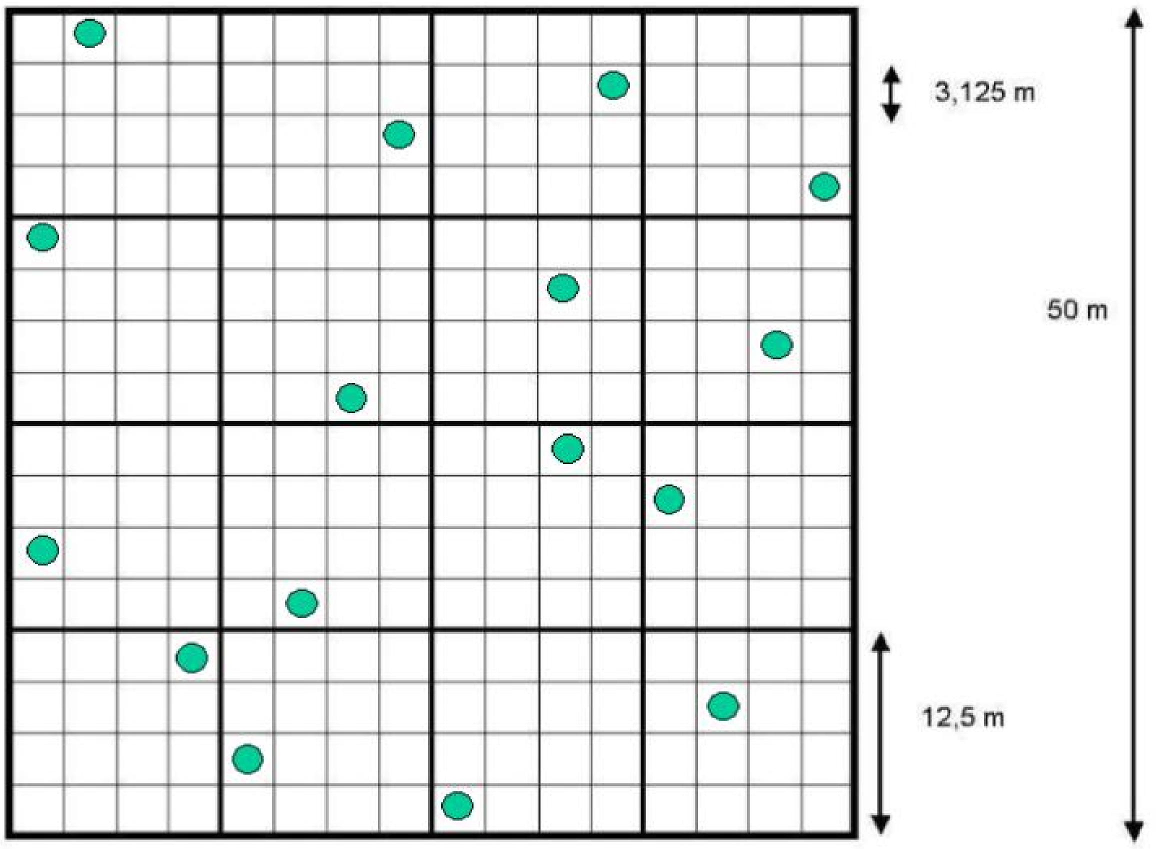


Fig. 1:
Sampling scheme for long-term sampling

In order to ensure comparable and reproducible sampling over a long period of time, the sites selected for the extraction of the samples must be protected by contract against disturbing influences and interference by third parties. It is particularly important to prevent contamination by extraneous substances (waste of all types, fertilisers, pesticides, wood preservatives, anti-corrosion agents etc.). Unavoidable exceptions should be cartographically recorded as accurately as possible, stating the exact location, time, quantity and substance data and documented in the sampling report. In the case of cultivated areas, the type of cultivation, information on utilisation (e.g. fertilisation, plant protection) must be noted as fully as possible in the sample data sheet. Furthermore, disturbance of the site by other sampling and research activity must be avoided.

4.3 Selection of sampling points and quantities

For each sampling site, mixed samples are taken for three soil horizons (humus cover or root tangle, topsoil, subsoil) for storage. The cover (if available) should consist of 5 kg fresh weight (FG) of humus cover material, and the two mineral-soil horizons of at least 15 kg soil material (FG) each.

To obtain these mixed samples, 16 systematically distributed individual samples are extracted from the defined sampling site. For this purpose, a rectangular / square 4 x 4 grid is placed over the sampling site. Each square of the grid is sub-divided into a further 4 x 4 grid (see Fig. 1). The point scheme for the systematic sample extraction is shown in the sample data sheets and is updated for each sampling operation.

With this specified grid geometry, a total of 16 sampling operations is possible. For a sampling interval of 4 years, this is equivalent to a period of 60 years, after which a new sampling site must be defined.

Obstacles and irregularities such as vehicle tracks, locally compressed ground, tree stumps, fallen trees etc. as well as former sampling points should be avoided.

Excess soil material remaining after boring should wherever possible be replaced in the bore hole. It should never be scattered on the humus cover. The evaluation, selection, combining, mixing and placing of the samples in containers must always be done outside the sampling site.

In the case of wooded areas, the area within a radius of at least 50 cm (for deciduous trees 100 cm) around the base of the trunk of older trees as well as the visible stem-flow area should be avoided.

Similarly, areas under clearings and gaps in the crown canopy should not be selected where these are larger than the area covered by an average tree crown (e.g. also beetle gaps, windfall etc.).

In unforested areas, the soil samples should be taken outside the crown range of isolated trees, even if samples are being taken from the trees themselves (e.g. Lombardy poplars).

4.4 Material and equipment

For the pedological characterisation of the area and selection of the sampling sites the following equipment is required:

- Pürckhauer boring rod 1,0 m and 1,5 m
- Plastic mallet
- "COBRA" boring set (if required) with lifting tongs and hammer drill (or similar device)
- Pulling device with derrick
- Spades and other excavating tools
- Surveying instrument for documenting and tracing site limits and sampling points (at least one tape measure min. 20 metres, GPS, geological compass or theodolite and several range poles)
- Coring cylinders (100 or 250 ml of steel or aluminium with tight-sealing plastic covers, padded carrying case and appropriate striking device)
- Hydrochloric acid (HCl 10%) and distilled water in washing bottles
- pH-measuring device with accessories and standardised sampling tubes
- Gradient indicator / geological compass
- Canister with water and cellulose cloths
- Camera
- Munsell colour chart
- Scale rod with colour divisions.

4.5 Sampling period and frequency

Soil sampling takes place every four years.

The sampling process takes place in late summer or early autumn before leaf fall. It is generally done in the months of September or October depending on the location of the sampling site, climatic conditions and current weather. The sampling period is stated in the site-specific sampling plan.

Depending on the weather, repeated sampling at the same site should always be carried out in the same period (max. +/- four weeks). Exceptional conditions such as longer periods of rain or very heavy rain must be documented.

4.6 Area-related sampling plan

For each sampling site, there are specifically defined constants which are based on the sampling guidelines, e.g.:

- Sampling period
- Coding of the PNF of the sampled horizons
- Statement of the exact size of the PNF
- Detailed maps with exact descriptions of the position of the PNF and sample-extraction points
- Authorities responsible for approvals, co-ordination and accompanying staff
- Sampling technique
- Data on types and quantity of sample.

These special area characteristics are documented in an area-specific sampling plan and are therefore used to implement the sampling guidelines according to the predominating specific conditions.

5 Conduct of sampling process

All the data from the sampling process and description of sample must be entered in the appropriate sample data sheets (PDBI). In addition, a report should be completed with the following content:

- names of persons taking part in the sampling process including the supervisor of the process and external assistants,
- chronological sequence of sampling process,
- the version of the guidelines on which the sampling process was based and of the area-related sampling plan, and
- any deviations from the sampling guidelines and the area-related sampling plan.

5.1 Technical preparations

Before taking the sample, the site must be carefully inspected. Any new areas of disturbance must be recorded and taken into account in fixing the location of the individual bores.

5.2 Equipment required and regulations for cleaning

The following equipment is required for sampling:

- Split-Tube-Sampler (STS),
- stainless-steel cutting frame (20 x 20 cm edge length, 10 cm height),
- stainless-steel knife, spatula and large pair of tweezers (not chromium or nickel-plated), cleaned in accordance with regulation),
- tape measure (4) length 50 metres for measuring the grid areas,
- balance (at least 5 kg, accurate to 1 g),
- stainless-steel round-hole screen sieves (2 mm and 5 mm) with sieve trays,
- sample containers
    - at least 2 stainless-steel basins, each with at least 10 l capacity,
    - stainless-steel vessels (1,5; 3,5 or 5 l) with loosely-fitting lids secured by clips; each sample container must be uniquely marked with an engraved or punched number,
    - additional vessels for sieve residues as required (e.g. Schott-Duran screw-top bottles, polyethylene bags [PE]),
- cooling devices for rapid freezing and storage of samples in the gas phase over liquid nitrogen (LIN), transportable LIN-Dewar(s) for the required number of stainless-steel containers,
- air-temperature thermometer.

The preliminary cleaning of the sampling containers and equipment must be carried out in a laboratory washing machine with chlorine-free intensive cleaner in the first wash phase followed by hot rinsing at 95°C. After neutralisation with phosphoric acid and hot water, the contents of the machine rinsed with hot and cold distilled water.

5.3 Sampling technique

Humus cover (O horizon)**:**

At the intended boring points, before taking the topsoil samples, a cutting frame of precisely defined size (20 x 20 cm) is used to remove the humus cover (if any) down to the top of the mineral soil. The humus cover is removed in the following stages:

- carefully remove living plants, twigs, cones etc.
- position cutting frame and press it down lightly,
- using a sharp (but not too thick) stainless-steel knife, cut through the humus cover at the inner edge of the frame,
- remove the humus cover carefully using spatulas and forceps and place it in a stainless-steel basin; ensure that the O-layer is removed completely without any particles of mineral soil,
- remove any coarser skeletal particles (fractions > 5 mm diameter and > 5% by volume) large living roots etc. by hand using the stainless-steel forceps,
- both of these fractions (skeletal material and coarser roots) of the material removed > 5 mm are collected separately in stainless-steel basins and weighed; this material is then discarded.
- carefully remove the cutting frame and measure the thickness of the humus cover (at least 4

points) and document this as an average figure in the sub-sample list PDBI.2.

- determine the sample mass, area and volume:
    - Extracted mass (FG) of all cuts = total mass of humus cover
    - Total mass of humus cover
– mass of skeletal material
– mass of coarse roots
= total mass of humus
    - Number of extraction points
x frame area
= total extraction area of humus cover
    - Sum of all thicknesses
x frame area
= extraction volume of humus cover.
- transfer the humus sample (min. 5 kg FG) to stainless-steel containers for transport under cryogenic conditions.

For municipal park and grassland areas, the conglomerate of roots is sampled and processed separately from the mineral soil in the same way as the humus cover.

Mineral soil (A and B horizon**):**

The mineral soil is sampled by horizon at two extraction depths (topsoil and subsoil). The samples are extracted by cutting cylindrical soil cores using a core or sleeve-type borer (split-tube sampler). The borer must have a uniform fixed cutting-edge diameter (∅ 4.8 cm) and must be designed in such a way as to substantially preclude compression of the soil core*.

The thickness of the topsoil horizon must be measured for each individual cut and documented in the sampling report. This data is required for calculating the original volume of the overall sample and the corresponding soil area.

In the case of very shallow A horizons (Ah < 3 cm), the following AhBv horizon (if present and A features are clearly marked) can be sampled at the same time. This must be documented in the report. The following subsoil sample is taken only in the first subsoil horizon taking into account of the thickness of the topsoil (A horizon) down to a maximum depth of 40 cm measured from the top surface of the mineral soil, i.e. with top soils of low thickness, the subsoil is also sampled down to a low depth only. Any deviation must be entered in the report.

This procedure is adequate because the contaminants under examination accumulate mainly in the upper layers of the soil.

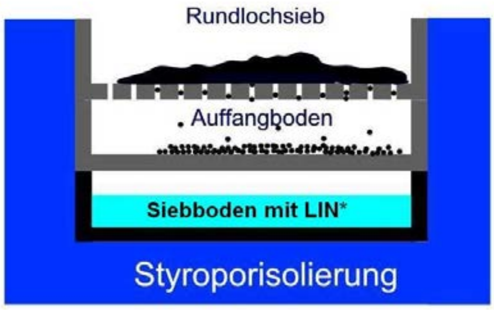
The topsoil and subsoil samples extracted from each sampling point are weighed and sieved to 2 mm (see Fig. 2) in the field under field-moist conditions. During the sieving operation, they are frozen on a plate cooled from below by liquid nitrogen. After sieving the material (min. 12 kg FG) is transferred to stainless-steel containers. The residue from sieving (skeletal material, organic material etc.) is packaged in PE boxes or bags and dried and sieved later in the laboratory. The weight fractions are then determined in order to calculate the distribution between fine soil (< 2 mm) and skeletal material (> 2 mm). The residue from sieving is then discarded.

(*) Note: Contamination of the samples by metallic abrasion can be discounted (Weinfurtner et al., 2002).

<u>Chronological sequence of sampling:</u>

- Strike the split-tube sampling (STS) into the area freed of debris for extraction of humus.
- Rotate the borer to break off the core and pull it vertically upwards. Open the borer and remove the shell section joined to the blade.
- Using a stainless-steel knife, cut the core at the bottom limit of the Ah or Ap horizon perpendicularly to the surface. Measure the thickness with an accuracy of 0,5 cm and document the measurement in the PDB1.3.
- Cut the fraction of the subsoil to be sampled (down to a maximum depth of 40 cm from the surface of the mineral soil) to separate it from the remaining material and record the thickness in the PDBI. 4.
- Push material which is not to be sampled cleanly downwards and discard it. Replace it in the bore hole or deposit it outside the PNF.

- Collect sampled topsoil and subsoil material by horizon quantitatively in one stainless-steel basin each.
- Weigh collective samples of topsoil and subsoil material (from 16 cuts each) = total mass of top-soil and subsoil.
- Sieve field-moist material in the field to 2 mm and deep-freeze the material during the sieving operation.
- Place the fine material < 2 mm in stainless-steel containers for transport under cryogenic conditions.
- Weigh the residue from sieving.
- Pack the sieving residue in PE boxes or bags and transport these to the laboratory.
- Dry and weigh the sieving residue in the laboratory. Re-sieve this material to 2 mm and re-weigh both fractions (> and ≤ 2 mm). The mass of the fraction > 2 mm is equivalent to the mass fraction of the skeletal material. Discard the sieving residue.
- Determine the sampled mass, area and volume:
    - o Mass extracted (FG) by all cuts = total mass of each mineral-soil horizon
    - o Total mass of each mineral-soil horizon
      \- mass of skeletal material
      = total mass of fine soil (≤ 2 mm) for each soil horizon
    - o Number of cuts
      x area of STS
      = total extraction surface of each mineral-soil horizon
    - o Sum of all thicknesses
      x extraction area of STS
      = extraction volume of each mineral-soil horizon



***** LIN**:** liquid nitrogen

Fig. 2: Schematic diagram of sieving / refrigerating set

5.4 Sample processing and pedological characterisation

The samples stored in liquid nitrogen are processed in the laboratory while maintaining the freezer chain.

First of all, if necessary, soil particles of the mineral-soil horizons which are frozen together are crushed carefully in a jaw crusher. The material is then homogenised in a mixer. Sub-samples of this homogenised material are then taken for pedological characterisation. The remaining sample material is divided into single samples for archiving (approx. 100 g fresh matter), placed in 100 ml Duran glass flasks and stored in the sample bank.

The material from the humus cover / root conglomerates is reduced to a size of 5 mm in a cutting mill or jaw crusher and then processed as described above.

With the sub-samples taken for pedological characterisation the following parameters are determined:

- Water content (to DIN EN 15934)
- Content of C_{org} (to DIN ISO EN 15936)
- Carbonate content (if anticipated) from the difference C_{tot} - C_{org}
- Grain-size distribution (to DIN ISO 11277)
- pH (H_2O, $CaCl_2$ und KCl), (to DIN EN ISO 10390)

These parameters serve as base data for evaluation of the analysis results.

6 Documentation

In general, all the data measured should be filed. With regard to the pedological description of the area, the latest editions of the documents stated in section 4.1 (literature, maps etc. KA 5) must be used and evaluated. The sequence of every sampling session must be documented in the attached sample data sheets (PDBI). The sample data sheets are arranged as follows:

PDBl. 1: Description of the extraction points, sampling period, persons participating, weather conditions

PDBl. 2: Report on site- and volume-related sampling of humus cover / root conglomorate

PDBl. 3: Report on site- and volume-related sampling of top soil

PDBl. 4: Report on site- and volume-related sampling of sub-soil

PDBl. 5: List of containers (aliquots)

PDBl. 6: Notes, deviations which are not specified in the sample data sheets.

The mass per m^2 of soil area is calculated using the density obtained from the volume and weight data.

The comparative values in the form of mass per m^2 of top soil and humus cover are obtained from the sum of the individual fractions.

In addition to sample identification, the sub-sample list contains information on the description of the horizon sampled in each case, and the corresponding horizon thickness (PDBI. 2 - 4).

Description of the sampling site

For the correct designation of the sampling site, a map section or a position diagram to the scale of 1:500 or 1:200 should be prepared in which the durably marked sampling site is accurately shown. It should also show:

- the position of the sampling grid,
- the position of the profile ditches, boring and sampling-extraction points
- any disturbed parts of the area with dimensions and direction if required.

The weather conditions in the sampling area immediately before and after sampling must be documented in PDBI. 1.

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DIN ISO 18400-102: 2020: Soil quality –Sampling –Part 102: Selection and application of sampling techniques

DIN ISO 18400-104: 2020: Soil quality –Sampling –Part 102: Selection and application of sampling techniques

DIN ISO-18400-107: 2020: Soil quality –Sampling –Part 107: Recording and reporting

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Check list for preparation and conduct of sampling

Sample type:	**Soil**
Target compartments	Cover horizon 1 and 2. Mineral-soil horizon (top and sub-soil)
Sample quantity for UPB	Min. 5 kg FG humus cover, 15 kg FG top soil, 15 kg FG sub-soil
Sampling period	Early September to late October before the leaves fall
Sampling frequency	Every four years
Equipment required for field work	• Sample data sheets for documentation during sampling process • Split-tube-sampler (STS) • Stainless-steel cutting frame (20 x 20 cm edge length and 10 cm height) • Knife, spatula and large tweezers (all of stainless steel - not chromium or nickel-plated, cleaned according to regulation) • Measuring tape (4 tapes of 50 m) for measuring grid areas • Balance (for at least 5 kg; accurate to 1g) • Round-hole sieve (2 mm and 5 mm) and sieve trays (stainless steel) • Liquid nitrogen • Laboratory gloves and clothing • Equipment and protective clothing for handling liquid nitrogen • Paper cloths
Sample packaging up to processing	• Stainless-steel containers (1,5; 3,5 and 5 litres) with lid and clip
Sample transport and Intermediate storage	Equipment for rapid deep freezing and storage of samples in gas phase over liquid nitrogen (LIN)

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Sample data sheet 1: sampling point
Soil

Identification: Date:

1	2	3	4		5		6	7	8	9		10	11	12	13	14		15
				/		/					/						/	

Sample type | Condi-tion | Sampling date | Sampling site | Other data

Coordinate system:

☐ UTM ☐ Gauss-Krüger Geographical latitude and longitude

Northing: . km Long.: ° ' "

Easting: . km Lat.: ° ' "

Elevation: Slope: Exposure:

m = height above MSL ° or %

Size of sampling area: m^2

Use:

Note:

Sampling carried out by: Date: to: Date:
Time: Time:

Sampling carried out by:

Weather:
Temperature
Precipitation

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Sample data sheet 2: area and volume-related sampling, humus cover and root conglomerate
Soil

Identification: Date:

1	2	3	4	/	5	/	6	7	8	9	/	10	11	12	13	14	/	15
				/		/					/						/	
Sample type					Condit.		Sampling date					Sampling site						Additional data

Container numbers:

Serial number	Total weight (g)	Thickness (cm)	Roots (g)	Skeletal fraction (g)	Notes
Cutting-frame size (cm^2):					
Number of cuts:					
Total area sampled (cm^2):					
Total volume sampled (cm^3):					
Total mass sampled (g):					
Total weight, humus (g):					
Total weight, root residues (g):					
Total weight, skeletal material (g):					

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Sample data sheet 3: area and volume-related sampling, top soil
Soil

Identification: Date:

1	2	3	4		5		6	7	8	9		10	11	12	13	14		15
				/		/					/						/	
Sample type					Condit.		Sampling date					Sampling site						Additional data

Container numbers:

Serial number	Total weight (g)	Horizon	Thickness (cm)	Notes
Diameter of STS (cm):				
Number of cuts:				
Total area sampled (cm^2):				
Total volume sampled (cm^3):				
Total mass sampled (g):				
Skeletal content (g):				

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Sample data sheet 4: area and volume-related sampling, sub-soil
Soil

Identification: Date:

1	2	3	4		5		6	7	8	9		10	11	12	13	14		15
				/		/					/						/	

Sample type Condit. Sampling date Sampling site Additional data

Container numbers:

Serial number	Total weight (g)	Horizon	Thickness sampled (cm)	Notes
Diameter of STS (cm):				
Number of cuts:				
Total area sampled (cm^2):				
Total volume sampled (cm^3):				
Total mass sampled (g):				
Skeletal content (g):				

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Sample data sheet 5: container list

Soil

Identification: Date

1	2	3	4		5		6	7	8	9		10	11	12	13	14		15
				/		/					/						/	

Sample type Condit. Sampling date Sampling site Additional data

Container list:

Sample designation:

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Sample data sheet 6: description of sample-extraction point
Soil

Identification: Date:

1	2	3	4		5		6	7	8	9		10	11	12	13	14		15
				/		/					/						/	

Sample type Condit. Sampling date Sampling site Additional data

Other remarks:

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Sampling Report
Soil

Sampling area: ________________________________ Identification: __ __ __ __ __

Applicable version of sampling guidelines __ __ . __ __ . __ __

Applicable version of sampling plan __ __ . __ __ . __ __

1. Aim of sampling: ____

____

2. Actual sampling period:

Date	Time		Sample no.		Notes
	from	to	from	to	

3. Participant: Supervisor/report ____

Participating ____

____

4. Check list for sampling plan and sampling guidelines: ☒ compliance

- ☐ 4.1 Sampling period
- ☐ 4.2 Sampling site and extraction point (selection / delimitation)
- ☐ 4.3 Equipment and technical preparations
- ☐ 4.4 Cleaning specification for packaging
- ☐ 4.5 Sampling technique
- ☐ 4.6 Number of samples
- ☐ 4.7 Data collection
- ☐ 4.8. Transport and temporary storage

Number, type and reason for deviation(s):

____

____

____

____

Notes: ____

____

________________________ __ __ . __ __ . __ __ ________________________

Reporter Date Signature