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Sampling and analysis of surface water in emergency situations

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Structure

- Grounds
- Assumptions
- Administrative decisions
- Personal context
- Sampling protocol
- Sampling locations
- Field research work
- Sampling
- Risk assessment
- Laboratory tests
- Analysis

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Grounds

- ISO 5667 (2007) Water characteristics – samples taken
- DIN 38402 – A15 Samples taken from flowing waters
- LAWA – AQS Instruction Samples taken from flowing waters (P-813, May 1998)

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Assumptions

- Sampling is an integral part of the analysis
- The goal of each sampling is obtaining a credible sample for research purposes, and delivering a classified sample to the lab.
 - What is particularly important, and difficult in case of damage is
- Errors made in the course of incorrect sampling, storage and transportation – even if we use the most creative resources – cannot be rectified.
 - After an error has been identified, a phenomenon causing damage is usually absent
- Documentation is an important component of every instance of sampling.

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Administrative decisions

Procuring or rejecting approvals and further legal acts (i.e. claims) is pointless because they can be challenged. Sampling is one of the first steps and, for a number of reasons, also the most efficient one in research when administrative decisions are challenged.

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Personal context

- Trained as technician, lab technician, supplier and user, or other appropriate training in the area
- Intensive, regular trainings
- A sampling team (at least 2 people)
- A person responsible for sampling is accountable for appropriate and expert sampling

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Sampling protocol

Sampling protocol and shipping documents are regarded to be legal documents in case of disputes.

- Their role is to secure evidence
- Lack of universally accepted procedure of securing evidence

Further means of securing evidence:

- Photographic documentation
- In some cases, location sketch, GPS co-ordinates

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Sampling protocol

Minimum requirements:

- Type of sampling
- Sampling locations (km of the river, drainage)
- Time and date of taking the sample
- Name of the person taking the sample, witnesses
- Sample marking
- Marking the bottles before they are filled
- Signatures (2 people)

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Sampling protocol

Observe on location

- Weather conditions, such as wind, ice, rain or snowfall, and so on.
- Local specification, such as murkiness of the water, its smell, colour, foaming or gases present, oil patches, floating foam, etc.
- Fish behaviour, like attempts to breathe air, jumping.

Loose sheets of paper should not be used to make provisional notes – standard sampling protocols are to be found in the attachment to DIN standards or AQS instructions.

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Sampling locations

1. Further downstream from the damage

A representative location, a lateral profile, a bridge, in case of large disasters a cloud of pollutants should be followed, and local populations downstream should be informed within the framework of alert and warning plan.

2. At damage location (drainage)
3. Upstream from damage location (initial load)

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Field research work

Using measurement devices (electrodes)

- temperature
- oxygen
- PH values
- conductivity

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Sampling

- Scoop, bucket (plastic or stainless steel)
- Random sampling
- A glass bottle (at least 2 litre capacity) with a polished plug
- Filled up, no air
- Lack of universal maintenance
- The only type of conservation that can be used is cooling the sample down to 4°C
- Quick transportation to the test lab
- Protecting a number of species of fish against extinction
- Credibility of samples is impossible to maintain if water is contaminated by oil

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Risk assessment

Risk assessment for people and environment

- Identifying quantity, type, characteristics and risks connected with the substance
 - Forms with safety data, shipment documentation
 - Data banks: www.hvbg.de/bgia/stoffdatenbank
www.lubw.bwl.de/servlet/is/30631/
www.umweltbundesamt.de/wgs/
- Environment protection BSF AG phone number (0621-60 40 40)
- Sampling/ analysing
 - a. Field measurements (detection pipe, air)
 - b. Laboratory analysis

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Laboratory tests

- A spectrum of harmful substances – more than 30.000 key chemicals.
- Very important additional information!
- specific test (analysing a single substance) cannot be carried out unless the perpetrator is identified within specified time frame.

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Analysis

Summarizing classification (CSB, BSB, TOC, AOX)

Basic parameters (ph, conductivity, ions, etc.)

Heavy metals – Atomic spectrographic analysis

- Optical inductively coupled plasma – emission spectrometry (ICP – OES)
- ICP – mass spectrometry (ICP – MS)
- Atomic absorption analysis (AAS)

Organic compounds

- Gas chromatography (GC)
GC – MS – screening, qualitative indications as to the class of substance
- Liquid chromatography (LC, HPLC)
LC – MS - Screening
- Analysing single substances using various detectors in order to quantify a substance LHKW, oil, petrol, using Fire-Ion Detector (FID)

Lab report, quality assurance declaration, DIN EN ISO 17025 standard

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Thank you for your attention