

# Assessment of Preparation/Extraction Methods



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# The Problem

- In the course of an audit a number of analytical methods may receive samples from a variety of different preparation methods.
- The problem that presents itself is this:
  - How are assessors to assess this wide variety of preparation and extraction techniques?
- There are a number of options available:
  1. Accredited preparation methods
  2. Group similar but different matrices together
  3. Breakout each matrix as a unique matrix type



# The Problem

- **Option 1:** accredit preparation methods
- Leachate Preparation – Soil
- Method: TCLP
- Method Reference: based on EPA1311
- Parameters: Leachate
- Pros: -looking specifically at the steps involved in the TCLP method
- Cons: -feedback from assessors is that you cannot really assess the entire method which raises questions about the quality control done in the actual preparation method; e.g., ask an analyst re: duplicates, and the response is that “I don’t do them...the person running the ICP does that”
- -the assessor assessing the prep method may have to go to the ICP, IC, GC, etc....to follow-up the method; a lot of work for the assessor, and may be duplicating effort and lab resources – another assessor has probably already looked at the ICP
- -if another person has already assessed the ICP, no guarantee that they looked at QC specific to leachates
- 
- **Option 2:** include leachate as a type of “water”
- Metals – water, leachate
- Method: ICP
- Method Reference: based on EPA 1311, SM XXXX (basically lab lists all reference methods related to the preparation and analysis)
- Lab I.D: Lab lists all SOPs related to the preparation and analysis
- Pros: -cost-effectiveness
- Cons: -difficulties scheduling
- -is there a guarantee that the preparation part was assessed? What objective evidence is there?
- -cost to CAEAL: the lab incurs a cost of \$85 but the assessor may be spending a lot more time on the appendix, as he/she has to look at the method for metals in water and the TCLP method (and potentially other prep methods – see points below)
- -what happens when more than one preparation method is used to obtain a leachate for analysis? For example:
- Metals – water, leachate
- Method: ICP
- Method Reference: based on EPA 1311/GCSB/SWEP/SALM and SMXXXX
- This could be a nightmare logistically for the assessment team, and again, from a credibility point of view - do we have objective evidence that each of those prep methods was assessed?
- Technical Questions:
- Would each prep method result in different QC criteria? Is the duplicate criteria for Ca in leachate using the EPA1311 method the same as the duplicate criteria for Ca in leachate using the SALM method? Isn’t this the main reason you want to follow a sample through from prep to instrument?
- Would some/every prep method result in the same parameters? For example, if you do a SALM prep and a TCLP prep and put both extracts on the ICP, are you obtaining the exact same parameter? If not, then that may be a differentiating feature – i.e., if a prep method results in a different parameter (e.g., Ca vs “available Ca”, then it has to be a separate appendix). Kind of related – what if one prep method gives you a list of 4 parameters only for some reason (e.g., Ca, Mg, Na, K), and another prep method gives you a different list of parameters (Al, Ba, Cd, Cu) but they’re all done using the ICP?
- **Option 3:** breakout leachate as a unique matrix type
- Metals – leachate
- Method: ICP-TCLP
- Method Ref: based on EPA1311 and SMXXXX
- Metals – leachate
- Method: ICP-SALM
- Method Ref: based on SALMXXXX and SMXXXX
- Pros: -in keeping with the definition of an appendix (unique matrix-test method combination; a test method in turn is defined in terms of analytical technique and sample preparation)
- Cons: -increased cost to the lab
- -ICP may be assessed several times during the course of the assessment; and most of the elements of the appendix to the rating guide are not going to differ significantly – only the Quality Control?
- -TCLP method may end up being assessed a few times, since each assessor will start with the prep end of things (not efficient for the lab)
- Recommendations:
- Do we need a section on the appendix/separate checklist for prep methods?



# Scope Example-New Zealand

- SEARCH THE IANZ DIRECTORY

- Hill Laboratories

- Postal: Private Bag 3205 Hamilton 2001  
Street: 1 Clyde Street  
Phone: 07 858 2000 Fax: 07 858 2001  
WWW: [www.hill-labs.co.nz](http://www.hill-labs.co.nz)

- Business:**

- Terms:**

- CONFORMANCE STANDARD

- The OECD Principles of Good Laboratory Practice (1998)

- STATEMENT OF COMPLIANCE

- A general assessment for compliance with the OECD Principles of Good Laboratory Practice was carried out at the above laboratory as part of the International Accreditation New Zealand GLP Compliance Monitoring Programme. At the time of the assessment no deviations were found of sufficient magnitude to affect the validity of non-clinical studies within the Scope of Registration performed at these facilities.

- SCOPE OF REGISTRATION

- ANALYTICAL CHEMISTRY TESTING

- Analysis of agricultural chemical, veterinary drug residues and pharmaceutical drugs in agricultural samples and biological tissues and fluids by the following techniques

- High performance liquid chromatography
    - Gas chromatography

- ASSESSMENT DATE

- 1 - 2 June 2000 (Initial assessment)
    - 5 September 2001 (Routine Study Audit)
    - 8 - 9 August 2002 (Routine Reassessment)
    - 11 - 13 August 2004 (Routine Reassessment)

- CONFORMANCE STANDARD

- NZS/ISO/IEC 17025: 1999

- General requirements for the competence of testing and calibration laboratories.



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# Scope Example-New Zealand

- Many, many tests
- ENVIRONMENTAL MONITORING
- (a) Waters
- Part (I):
- In accordance with APHA and USEPA digestion procedures, and analysis by the techniques indicated
- Detection limits for potable/non-potable water depend on the technique used e.g. ICP-MS or ICP-OES and are available from the laboratory on request
- Ag, Al, As, B, Ba, Be, Bi, Ca, Cd, Co, Cr, Cs, Cu, Fe, Ga, K, La, Li, Mg, Mn, Mo, Na, Ni, P, Pb, Rb, S, Sb, Se, Si, Sn, Sr, Te, Ti, U, V, Zn
- Part (II): Organics
- The following tests by solid phase extraction followed by GC/GC-MSD
- Semivolatile organic compounds (SVOC)
- Polychlorinated biphenyls (PCB)
- Organonitrogen pesticides (ONP)
- Organophosphorus pesticides (OPP)
- Organochlorine pesticides (OCP)
- List of available SVOC, PCB, ONP, OPP, OCP compounds and detection limits available on request
- (c) Soils and marine sediments
- Part (I) : Metals
- Acid extractable and TCLP/SPLP extractable metals by inductively coupled plasma - mass spectrometry (ICP-MS). Mercury determination also by cold vapour AAS
- Detection Limits depend on the matrix tested e.g. soils or marine sediments and are available from the laboratory on request
- Ag, As, B, Ba, Bi, Cd, Co, Cr, Cs, Cu, Hg, La, Mo, Ni, Pb, Rb, Sb, Se, Sn, Sr, Ti, U, Zn
- Part (II) : Organics
- In accordance with methods based on those from the USEPA except where otherwise indicated
- Volatile organic compounds (VOC) - including BTEX & Trihalomethanes
- Semivolatile organic compounds (SVOC) - including PAH & OC
- Polyaromatic hydrocarbons (PAH)
- Many more tests...



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# Scope Example-Italy

## SEARCH RESULTS FROM SINAL ON-LINE DATABASE

- Last update: 11-03-2005. SINAL does not take any responsibility about incorrect or missing data published in this on-line database, which is not intended as an official reference information. Official lists and schedules of accreditation may be requested at no charge to the Laboratories concerned or to the SINAL office. SINAL values your feedback and/ or remarks on data published in this on-line database, and any other suggestion is welcome at our mailbox. Thank you.

### Schedule of accreditation of Laboratory: 0080

- **SGS Italia SpA U.O. Environmental Services di Villafranca Padovana**  
Via Campodoro, 25  
35010 Villafranca Padovana (PD)

- Tel. 049 9050013  
Fax 049 9050065  
E-mail [sgs.eco@sgs.com](mailto:sgs.eco@sgs.com)  
Web [www.sgs.com](http://www.sgs.com)

Complete schedule of accreditation (170).

- For tests marked by asterisk \*, the Laboratory has temporarily suspended the issue of SINAL endorsed test reports.

S.	Cat.	Object/product/material	Test description	Method/standard
•	0	Acque	Acido paraftalico	POP 20745 rev 2 2002
•	0	Acque	Aldeidi alifatiche	APAT Man29/5010/A/2003
•	0	Acque	Alluminio, Bario, Berillio, Molibdeno, Vanadio, Titanio	APHA 3111D 1998
•	0	Acque	Ammoniaca	APHA Standard Methods for the Examination of Water and Wastewater 20th Ed. 1998, 4500-NH3 H
•	0	Acque	Anioni in cromatografia ionica: Cl-, Br-, NO2-, NO3-, SO4--, PO4---, F-	APAT Man29/4020/2003
•	0	Acque	Azoto ammoniacale	APAT Man29/4030/2003
•	0	Acque	Azoto nitroso	APAT Man29/4050/2003
•	0	Acque	Azoto organico	APAT Man29/5030/2003
•	0	Acque	Azoto totale	APAT Man29/4060/2003
•	0	Acque	BOD5 (richiesta biochimica di ossigeno)	APAT Man29/5120/A-B/2003
•	0	Acque	Calcio	APAT Man29/3130/2003
•	0	Acque	Cianuri	APAT Man29/4070/2003
•	0	Acque	Cianuri	APHA 4500-CN-O 1998
•	0	Acque	Cloro attivo	APAT Man29/4080/2003
•	0	Acque	Cloruri	APAT Man29/4090/A1/2003



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# Scope Example-Italy

- Many, many tests...

•	0	Fanghi, Solidi, Rifiuti	Tallio	EPA 7840 1986
•	0	Fanghi, Solidi, Rifiuti	Test di cessione con acido acetico 0,5 M e determinazione del Cromo	
•	esavalente (VI)	CNR IRSA Q 64 II/A 1986 + APAT Man29/3150/C/2003		
•	0	Fanghi, Solidi, Rifiuti	Test di cessione con acido acetico 0,5 M e determinazione dei metalli	
		con ICP/MS (Al, Sb, As, Ba, Be, Cd, Co, Cr, Cu, Fe, Pb, Mn, Ni, Ag, Tl, Zn, Hg, Se, Sn, V)	CNR IRSA Q 64 II /A 1986 + EPA 6020 A 1998	
•	0	Fanghi, Solidi, Rifiuti	Test di cessione con acido acetico 0,5 M e determinazione dei metalli	
		con ICP/MS (Al, Sb, As, Ba, Be, Cd, Co, Cr, Cu, Pb, Mn, Ni, Ag, Tl, Zn, Hg, Se)	CNR IRSA Q 64 II /A 1986 + EPA 6020 A 1998	
•	0	Fanghi, Solidi, Rifiuti	Test di cessione con acqua satura di CO2 e determinazione dei	
		metalli con ICP/MS (Al, Sb, As, Ba, Be, Cd, Co, Cr, Cu, Fe, Pb, Mn, Ni, Ag, Tl, Zn, Hg, Se, Sn, V)	CNR IRSA Q 64 II/B 1986 + EPA 6020 A 1998	
•	0	Fanghi, Solidi, Rifiuti	Test di cessione con acqua satura di CO2 e determinazione dei	
		metalli con ICP/MS (Al, Sb, As, Ba, Be, Cd, Co, Cr, Cu, Pb, Mn, Ni, Ag, Tl, Zn, Hg, Se)	CNR IRSA Q 64 II/B 1986 + EPA 6020 A 1998	
•	SO DM 16/03/1998 GU n° 76 01/04/1998			
•	III	Rumore	Rumore in ambienti abitativi ed esterni	DPCM 01/03/91 GU n. 57 08/03/1991
•	III	Rumore	Rumore negli ambienti di lavoro	DLgs 277 15/08/91 GU n. 200 del 27/08/1991

- Many more tests ...

## Legenda

- Legenda D. LGS.: Decreto Legislativo D.P.C.M.: Decreto del Presidente del Consiglio dei Ministri ASTM: American Society for Testing and Materials POP: Metodi di prova interni del Laboratorio EPA: UNITED STATES Environmental Protection Agency OSHA: UNITED STATES Occupational Safety and Health Administration APHA: UNITED STATES American Public Health Administration NIOSH: UNITED STATES National Institute for Occupational Safety and Health APAT: Agenzia per la Protezione dell'Ambiente e per i servizi Tecnici CNR IRSA: Consiglio Nazionale delle Ricerche - Istituto di Ricerca sulle Acque D.M.: Decreto Ministeriale UNICHIM: Ente Federato all'UNI UNI: Ente Nazionale Italiano di Unificazione EN: Norma Europea ISO: International Organization for Standardization GU: Gazzetta Ufficiale CARB : California environmental protection agency Air Resources Board

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# Scope Example-Australia

- **ACCREDITATION NO: 2562**

- **SGS Environmental Services**
- Gippsland Chemical Laboratory  
Hazelwood Road  
TRARALGON VIC 3844

- CONTACT: Mr S Harvey  
PHONE: (03) 5172 1555 FAX: (03) 5174 9320 MOBILE: 0408 394 850  
EMAIL: Sheldon.Harvey@sgs.com  
WEB SITE: [www.au.sgs.com](http://www.au.sgs.com)

- FACILITIES: Public testing service

- **This laboratory complies with the requirements of ISO/IEC 17025 (1999)**

- **7.21 Miscellaneous petroleum products**

- .08 Electrical insulating oils and compounds
- Analysis by GC techniques  
by the methods of -  
in-house  
for the following determinations -  
Arochlors 1016, 1221, 1232, 1242, 1248, 1254, 1260

- **7.66 Waters**

- Analysis by AAS, auto - analyser, IC, UV-vis spectrophotometric and classical techniques  
by the methods of -  
in-house  
for the following determinations -  
Alkalinity (bicarbonate, carbonate, hydroxide); anionic surfactants; biochemical oxygen demand; chemical oxygen demand; chloride;  
chlorine residual; chlorophyll a; colour; dissolved oxygen; electrical conductivity; elements as listed under 7.84.01; fluoride; free  
carbon dioxide; hardness; nutrients as listed under 7.84.51; oil and grease; pH; silica; solids - suspended, total dissolved, volatile,  
total; sulphate; sulphide; total alkalinity; temperature; turbidity
- .01 Waters for potable and domestic purposes
- .02 Waters for irrigation and stock
- .03 Waters for industrial and steam-raising purposes
- .04 Sewage
- .05 Trade wastes
- Including saline trade waste
- .06 Saline waters
- Including trade waste
- .71 Sampling
- .99 Other waters
- Bore waters



# Scope Example-Australia

- **7.81 Constituents of the environment**
  - .11 Waters other than saline
    - As listed under 7.66 and 7.84
  - .12 Saline waters
    - As listed under 7.66 and 7.84
  - .21 Air
    - Continuous monitoring of ambient air and meteorological conditions

many, many tests...

  - .81 Volume measurement (air)
    - For tests under 7.82.01 and 7.82.08
- **7.84 Residues in constituents of the environment**
  - .01 Elements
    - Analysis of waters
      - Analysis by AAS (flame, furnace, vapour generation, hydride generation) techniques
      - by the methods of -  
in-house
      - for the following determinations -  
Aluminium; antimony; arsenic; boron; cadmium; calcium; chromium; cobalt; copper; iron; lead; magnesium; manganese; mercury; molybdenum; nickel; potassium; selenium; silver; sodium; zinc
    - Analysis of soils, sediments and sludges
      - Analysis by AAS (flame, furnace, vapour generation, hydride generation) techniques
      - by the methods of -  
In-house
      - for the following determinations -  
Arsenic; cadmium; chromium; copper; lead; mercury; nickel; zinc
  - .51 Nutrients
    - Analysis of waters
      - Analysis by classical, FIA and IC techniques
      - by the methods of -  
in-house
      - for the following determinations -  
Nitrogen - ammonia, nitrate, nitrite, organic, total Kjeldahl; phosphorus - ortho, total

• **Accreditation No: 2562**  
*Corporate Site No: 1013*  
(Scope Last Changed 11/03/04 )

- CHEM - Chemical Testing

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# Scope Example-USA- Illinois

STATE OF ILLINOIS  
ENVIRONMENTAL LABORATORY ACCREDITATION  
is hereby granted to  
ENVIRONMENTAL MONITORING AND TECHNOLOGIES, INC.  
8100 NORTH AUSTIN AVE.  
MORTON GROVE, IL 60053-3203

According to the Illinois Administrative Code, Title 35, Subtitle A, Chapter II, Part 186, ACCREDITATION OF LABORATORIES FOR DRINKING WATER, WASTE WATER AND HAZARDOUS WASTES ANALYSIS, the State of Illinois formally recognizes that this laboratory is technically competent to perform the environmental analyses listed on the scope of accreditation detailed below.

The laboratory agrees to perform all analyses listed on this scope of accreditation according to the Part 186 requirements and acknowledges that continued accreditation is dependent on successful ongoing compliance with the applicable requirements of Part 186. Please contact the Illinois EPA Environmental Laboratory Accreditation Program (IL ELAP) to verify the laboratory's scope of accreditation and accreditation status. Accreditation by the State of Illinois is not an endorsement or a guarantee of validity of the data generated by the laboratory.

Certificate No.: 001055

Janet Cruse

Accreditation Officer

Environmental Laboratory Accreditation Program Expiration Date: 07/10/2005

Issued On: 07/15/2004

ENVIRONMENTAL PROTECTION AGENCY

ACCREDITATION NUMBER #100256

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State of Illinois

Environmental Protection Agency

Awards the Certificate of Approval

Environmental Monitoring and Technologies, Inc.

8100 North Austin Ave.

Morton Grove, IL 60053-3203

According to the Illinois Administrative Code, Title 35, Subtitle A, Chapter II, Part 186, ACCREDITATION OF LABORATORIES FOR DRINKING WATER, WASTE WATER AND HAZARDOUS WASTES ANALYSIS, the State of Illinois formally recognizes that this laboratory is technically competent to perform the environmental analyses listed on the scope of accreditation detailed below.

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Certificate No.: 001055

Drinking Water, Inorganic

ASTM D1125-91A

Conductivity

SM2120B, 18Ed

Color

SM2150B, 18Ed

Odor

SM2320B, 18Ed

Alkalinity

SM2540C, 18Ed

Total Dissolved Solids



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NWRI • INRE

# Scope Example-USA- Illinois

many, many tests..

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State of Illinois

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Environmental Monitoring and Technologies, Inc.

8100 North Austin Ave.

Morton Grove, IL 60053-3203

Certificate No.: 001055

Hazardous and Solid Waste, Inorganic 1311

TCLP (Organic and Inorganic)

1312

Synthetic Precipitation Leaching Procedure

6010B

Aluminum Antimony Arsenic

Barium Beryllium Boron

Cadmium Calcium Chromium

Cobalt Copper Iron

Lead Magnesium Manganese

Molybdenum Nickel Phosphorus

Potassium Selenium Silver

Sodium Thallium Vanadium

Zinc

6020A

Aluminum Antimony Arsenic

Barium Beryllium Boron

Cadmium Calcium Chromium

Cobalt Copper Iron

Lead Magnesium Manganese

Molybdenum Nickel Potassium

Selenium Silver Sodium

Thallium Vanadium Zinc

7470A

Mercury

7471A

Mercury

9010B

Cyanide

9014

Cyanide

9020B

TOX - Total Organic Halides

9023

EOX-Extractable Organic Halides

9030B

Sulfides

9034

Sulfides

Many more tests

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# Scope Example-Germany

- **Dap Deutsches Akkreditierungssystem Prufwesen GmbH**
- Gesellschafter: Verband der Materialprüfungsämter e.V., Deutsche Gesellschaft für Zerstörungsfreie Prüfung e.V., Deutscher Verband für Schweiß- und verwandte Verfahren e.V., Germanischer Lloyd AG, LGA (Landesgewerbeanstalt Bayern), Verband der Technischen Überwachungs-Vereine e. v.
- **Anlage zur Akkreditierungsurkunde DAP-PA-3010.00**
- Gültigkeitsdauer: 2003-12-17 bis 2008-12-16
- Urkundeninhaber: ALA Analytisches Labor GmbH
- Charlottenstraße 14 52070 Aachen
- Prüfungen in den physikalischen, physikalisch-chemischen und chemischen Bereichen: Untersuchungen von Wasser, Schlamm, Sedimenten, Stoffen zur Verwertung, Abfall, Boden, kontaminierten Boden und Bodenluft;
- Probenahme von Abwasser, Wasser aus stehenden Gewässern, Grundwasserleitern und Fließgewässern sowie von Bodenluft
- Die aufgeführten und mit (A) gekennzeichneten Prüfverfahren entsprechen § 2 der Vereinbarung zwischen der Oberfinanzdirektion Hannover und den Akkreditierungsstellen DAP, DACH und DASMIN zur Akkreditierung von Prüflaboratorien und Ingenieurbüros im Rahmen der Erkundung kontaminationsverdächtiger/kontaminierter Flächen auf Bundesliegenschaften vom 22.05.2000.
- Für die chemische Analytik von Wasser, kontaminierten Boden und Bodenluft wird die Kompetenz für den vollen Umfang der geforderten Parameter bestätigt.
- Für den Bereich Probenahme von Wasser und Bodenluft wird die Kompetenz bestätigt.
- verwendete Abkürzungen: siehe letzte Seite
- Seite 1 von 14 Seiten
- 
- Anlage zur Akkreditierungsurkunde DAP-PA-3010.00
- 1. Wasser, Abwasser, Schlamm, Sedimente und Abfall 1.1 Probenahme
- ISO 5667-1 Wasserbeschaffenheit; Probenahme; Teil 1: Richtlinie für die
- 1996-02 Erstellung von Probenahmeprogrammen (mit Korrektur 1) (A)
- ISO 5667-2 Wasserbeschaffenheit; Probenahme; Teil 2: Richtlinien zur 1991-07 Probenahmetechnik (A)
- ISO 5667-11 Wasserbeschaffenheit; Probenahme; Teil 11: Hinweise zur 1993-03 Probenahme von Grundwasser (A)
- DIN 38402-A 11 Probenahme von Abwasser 1995-12 (MW)
- DIN 38402-A 12 Probenahme aus stehenden Gewässern 1985-06
- (A), (MB), (MW)
- DIN 38402-A 13 Probenahme aus Grundwasserleitern 1985-12
- (A), (B), (MB), (MW)
- DIN 38402-A 15 Probenahme aus Fließgewässern 1986-07
- (A), (B), (MB), (MW)
- DIN EN ISO 5667-3 (A 21) Wasserbeschaffenheit;
- 1996-04 Probenahme - Teil 3: Anleitung zur Konservierung und Handhabung von Proben
- DIN 38402-A 30 Vorbehandlung, Homogenisierung und Teilung heterogener 1998-07 Wasserproben (MW)
- DVWK 128 Entnahme und Untersuchungsumfang von Grundwasser- 1992 Proben (A), (MB)
- LAWA Probenahme von Abwasser AQS-Merkblatt P-8/1 1993-01
- LAWA Probenahme aus Grundwasser AQS-Merkblatt P-8/2 1995-05 (A), (MB)
- Seite 2 von 14 Seiten
- 
- Anlage zur Akkreditierungsurkunde DAP-PA-3010.00
- *DIN 38414-8 7 Aufschluss mit Königswasser zur nachfolgenden Bestimmung 1983-01 des saurelöslichen Anteils von Metallen*
- (Norm zurückgezogen - ersetzt durch DIN EN 13346)
- DIN EN 13346 (S 7) Charakterisierung von Schlamm - Bestimmung von Spuren- 2001-04 Elementen und Phosphor - Extraktionsverfahren mit Königswasser
- 
- DIN 38414-S 9 Bestimmung des Chemischen Sauerstoffbedarfs (CSB) 1986-09
- DIN 38414-S 12 Bestimmung von Phosphor in Schlamm und Sedimenten 1986-11
- DIN 38414-S 18 Bestimmung von adsorbierten, organisch gebundenen 1989-11 Halogenen (AOX) (A)
- DIN 38414-S 20 Bestimmung von 6 polychlorierten Biphenylen (PCB) 1996-01 (A), (B)
- LAWA CN 2/79 Richtlinie für das Vorgehen bei physikalischen und chemischen Untersuchungen im Zusammenhang mit der Beseitigung von Abfällen; Bestimmung des Cyanids in Abfällen
- 
- 2. Boden und kontaminierte Boden
- 2.1 Probenvorbereitung und Probenvorbereitung DIN ISO 11464 Bodenbeschaffenheit;
- 1996-12 Probenvorbereitung für physikalisch-chemische Untersuchungen
- (A), (B), (MB)
- DIN ISO 11466 Bodenbeschaffenheit;
- 1997-06 Extraktion in Königswasser löslicher Spurenelemente (A), (B), (MB)
- 
- E DIN ISO 14507 Bodenbeschaffenheit;
- 1996-02 Probenvorbereitung für die Bestimmung von organischen (A), (B), (MB) Verunreinigungen in Boden
- DIN 18123 Baugrund - Untersuchung von Bodenproben - Bestimmung 1996-11 der Korngrößenverteilung (A), (MB)
- 
- DIN 19730 Bodenbeschaffenheit;
- 1997-06 Extraktion von Spurenelementen mit Ammoniumnitratlösung (A), (B), (MB)
- 
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