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Soil quality — Assessment of impact from soil contaminated with petroleum hydrocarbons

Qualité du sol — Évaluation de l'impact du sol contaminé avec des hydrocarbures pétroliers

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Contents

Page

Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 2.

The main task of technical committees is to prepare International Standards. Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights.

ISO 11504 was prepared by Technical Committee ISO/TC 190, *Soil quality*, Subcommittee SC 7, *Soil and site assessment*.

Introduction

Petroleum hydrocarbons (PHCs) are common environmental contaminants. They are components of crude oil and products derived from it and are consequently found on a variety of sites including refineries, sites where they are used as feedstock (e.g. for manufacture of plastics), manufactured gas production sites, sites where hydrocarbons are used as fuel or lubricants and retail service stations. They may also be present as a result of spills and leaks during transportation.

Petroleum hydrocarbons can present unacceptable risks to the health and safety of humans, ecological systems, surface water, groundwater resources and to structures and building materials. Measuring the total concentration of petroleum hydrocarbons (TPH) in soil (and pore water and pore gas) does not give a useful basis for the evaluation of the potential risks to man and the environment. The variety of physical-chemical properties, and thus differences in the migration and fate of individual compounds, and the toxicity and carcinogenicity of different fractions and compounds in oil products, must be taken into account in human health and environmental risk assessments.

Only a limited number of individual compounds can be routinely identified and quantified. It is, consequently, necessary to adopt methods of analysis that provide information about the amount of different hydrocarbon fractions present, preferably distinguishing between aliphatic and aromatic fractions, and the concentrations of single compounds of particular concern in respect of the potential health and environmental risks that they pose.

Although most petroleum hydrocarbons found in soil are of an anthropogenic nature, there are some natural sources of these materials and other organic substances (e.g. peat and coal). The analytical methods historically used for the measurement of total petroleum hydrocarbons (TPH) tend to measure natural materials as TPH. This issue will not be dealt with in this International Standard, except to note that a method able to give a more precise determination of the petroleum hydrocarbons is less prone to giving results that can be misinterpreted and potentially lead to unnecessary or unsustainable remedial actions.

The purpose of this International Standard is to give recommendations with respect to the choice of relevant fractions and individual compounds, and to give guidance on the appropriate use of the results. Decisions about which analytical methods to adopt must be based primarily on the need to provide the right type and quality of data for use in risk assessments. This requires consideration of how the results of the analysis are most appropriately used in a risk assessment, e.g. how can the fractions be used in exposure models and assessments, and is it sufficient to analyse soil or is it necessary to obtain related values in other media as well (pore water and pore gas).

There are three published International Standards covering the analysis of the range of petroleum hydrocarbons of interest:

ISO 16703 can be used to measure mineral oil (C_{10} to C_{40}) and ISO 22155 or ISO 15009 to measure volatiles. However, revised methods are required to be able to properly measure the fractions and compounds recommended for determination in this International Standard. ISO/TC 190 is developing International Standards for methods of analysis designed to be compatible with the recommendations provided in this International Standard.

Soil quality — Assessment of impact from soil contaminated with petroleum hydrocarbons

1 Scope

This International Standard gives recommendations with regard to the choice of fractions and individual compounds when carrying out analysis for petroleum hydrocarbons in soils, soil materials and related materials, including sediments, for the purpose of assessing risks to human health, the environment and other possible receptors. Since many products based on petroleum hydrocarbons often contain substances that are not hydrocarbons, the recommendations also encompass such compounds where relevant.

This International Standard also includes relevant background information on which the recommendations are based together with guidance on the use of the fractions recommended in the assessment of risk.

This International Standard does not set criteria or guidelines for use as assessment criteria, since this is typically a national or regional regulatory issue. This International Standard also does not include recommendations as to the specific model for the exposure assessment or the specific parameter values to be used; with respect to guidance on this matter, reference is made to ISO 15800.

2 Normative references

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 11074, *Soil quality — Vocabulary*

ISO 15009, *Soil quality — Gas chromatographic determination of the content of volatile aromatic hydrocarbons, naphthalene and volatile halogenated hydrocarbons — Purge-and-trap method with thermal desorption*

ISO 15800, *Soil quality — Characterization of soil with respect to human exposure*

ISO 16703, *Soil quality — Determination of content of hydrocarbon in the range C_{10} to C_{40} by gas chromatography*

ISO 18512, *Soil quality — Guidance on long and short term storage of soil samples*

ISO 22155, *Soil quality — Gas chromatographic determination of volatile aromatic and halogenated hydrocarbons and selected ethers — Static headspace method*

ISO 25177, *Soil quality — Field soil description*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 11074, ISO 15800, ISO 25177 and the following apply.

3.1
aliphatic hydrocarbon
acyclic or cyclic, saturated or unsaturated carbon compound, excluding aromatic compounds

3.2
aromatic hydrocarbon
hydrocarbon, of which the molecular structure incorporates one or more planar sets of six carbon atoms that are connected by delocalized electrons, numbering the same as if they consisted of alternating single and double covalent bonds