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Soil quality — Sampling —

Part 101: Framework for the preparation and application of a sampling plan

Qualité du sol — Échantillonnage —

Partie 101: Cadre pour la préparation et l'application d'un plan d'échantillonnage

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Foreword

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The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

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For an explanation on the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT) see the following URL: www.iso.org/iso/foreword.html

This document was prepared by Technical Committee ISO/TC 190, *Soil Quality*, Subcommittee SC 2, *Sampling*.

This first edition of ISO 18400-101, together with ISO 18400-104 and ISO 18400-107, cancels and replaces ISO 10381-1:2002, which has been technically and structurally revised. The ISO 18400 series is based on a modular structure and cannot be compared to ISO 10381-1 clause by clause.

A list of all parts in the ISO 18400 series can be found on the ISO website.

Introduction

The characterization of soils and soil materials within the scope of this document, in terms of their potential environmental impact, or suitability for a particular use, requires a variety of tests to be performed. These tests may relate to the chemical, physical and biological properties of the soil or soil material. Validity of these tests requires performance on a representative sample or a number of representative samples.

The potential scope of an investigation programme can be complex; the process flowchart in Figure 1 defines seven key elements that make up the essential elements of the investigation programme. The principles outlined in this document provide a framework that can be used to design and develop a sampling plan, which is the first of the seven key elements. Other International Standards provide detailed instructions on how to complete the remaining key elements.

Before any investigation programme is devised, it is important that the objectives be first established since they are the major determining factors for the actual sampling, e.g. the position, density and depth of sampling points, time of sampling, sampling procedures, the acceptable levels of sampling uncertainty and the subsequent treatment of samples and analytical requirements. The details of an investigation programme depend on whether the information needed is the average value, the distribution, or the variability of given soil parameters.

The degree of detail and measurement uncertainty required and also to the manner in which the results are to be expressed and presented, for example, concentration of constituents, maximum and minimum values, arithmetic means, median values, etc. needs some considerations. Additionally, it is advisable to compile a list of constituents of interest and the relevant analytical procedures consulted, since these will usually give guidance on precautions to be observed during sampling and subsequent handling of soil samples. The investigation programme design often involves iterative discussion between the involved parties.

Given that complexity, a sampling plan is defined by the specific objectives of the investigation programme and how those objectives can be practically achieved with reference specifically to the sampling activities for the situation under investigation. The sampling plan provides simple and unambiguous instructions for the sampler, and as a consequence sampling is to be performed only when an approved sampling plan is available.

A large variety of sampling objectives exist, including the following:

— sampling of ex-situ soil (e.g. soil stockpiles) in order to estimate the (average) concentration of constituents in a specified quantity of soil material;

— sampling of agricultural, natural and near natural soils in the landscape in order to estimate the (average) concentration of constituents over a specified soil area and depth;

— sampling to determine chemical, physical or biological characteristics of the soil material;

— sampling of (potentially) contaminated sites in order to characterize and delineate the contamination and to estimate the risks for human health and the environment.

ISO 18400-104[1)] requires that a preliminary (phase 1) investigation comprising a desk study and a site reconnaissance is carried out before any sampling or other intrusive activities are carried out. The extent of the preliminary investigation will depend on the objectives of the overall investigation and the on-site activities expected will be required (see ISO 18400-202[1)].

It will often be necessary to carry out an exploratory (phase 2) investigation as described in ISO 18400-104[1)] before the final objectives for the detailed (phase 3) investigation can be defined.

It is important to take into account all relevant data from previous investigation programmes at the same or similar locations and other information on local conditions. Previous personal experience can

1) Under preparation.

also be very valuable. Time and money allocated to the design of a proper investigation programme is usually well justified because it ensures that the required information is obtained efficiently and economically.

In addition to the design and development of a sampling plan, this document deals with the actual sampling in accordance with that sampling plan and it deals with the development of the sampling report. A sampling plan shows details of all the information pertinent to a particular sampling exercise.

The procedural elements that will be considered to complete key element 1 'The preparation and application of a sampling plan' are detailed in Figure 2. It is this process map that provides the basic framework for the practitioner developing a sampling plan to meet the requirements of any investigation programme. This document can be used to

— produce standardized sampling plans for use in more routine circumstances,

— incorporate the specific requirements of national legislation, and

— design and develop a sampling plan for use on a case-by-case basis.

This document is part of a series on sampling standards for soil. The role/position of the International Standards within the total investigation programme is shown in Figure 1.

Essential information for the application of this document and reference to all International Standards belonging to the ISO 18400 series is provided in ISO 18400-100. ISO 18400-100 will be updated on a regular basis as long as the International Standards of this series are under development.

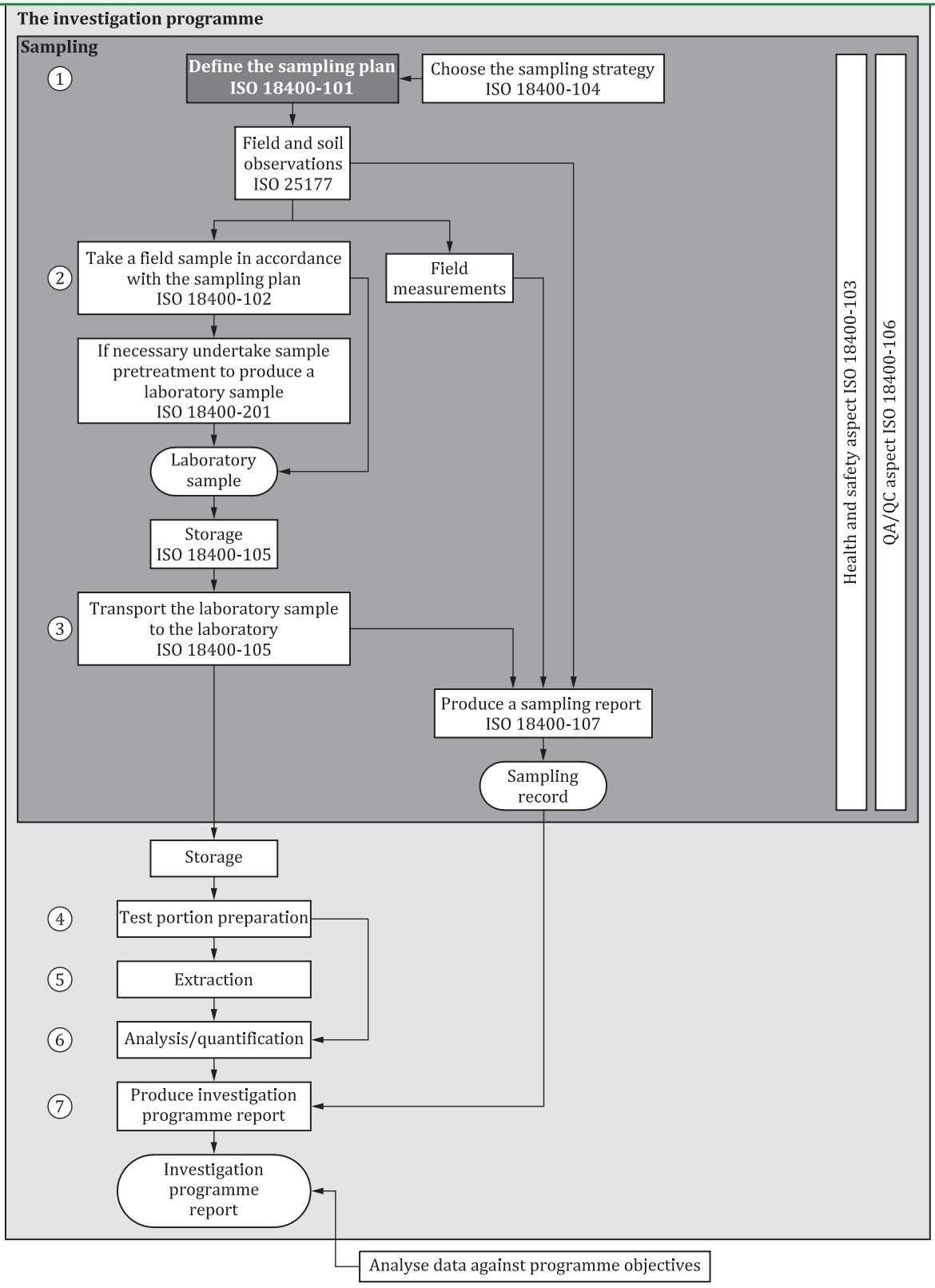

Figure 1 — Links between the essential elements of an investigation programme

NOTE 1 Numbers in circles define the key elements (1 to 7) of the investigation programme.

NOTE 2 Figure 1 displays a generic process which can be amended when necessary.