WHAT'S BENEATH THE SURFACE MATTERS

Soil Testing Solutions

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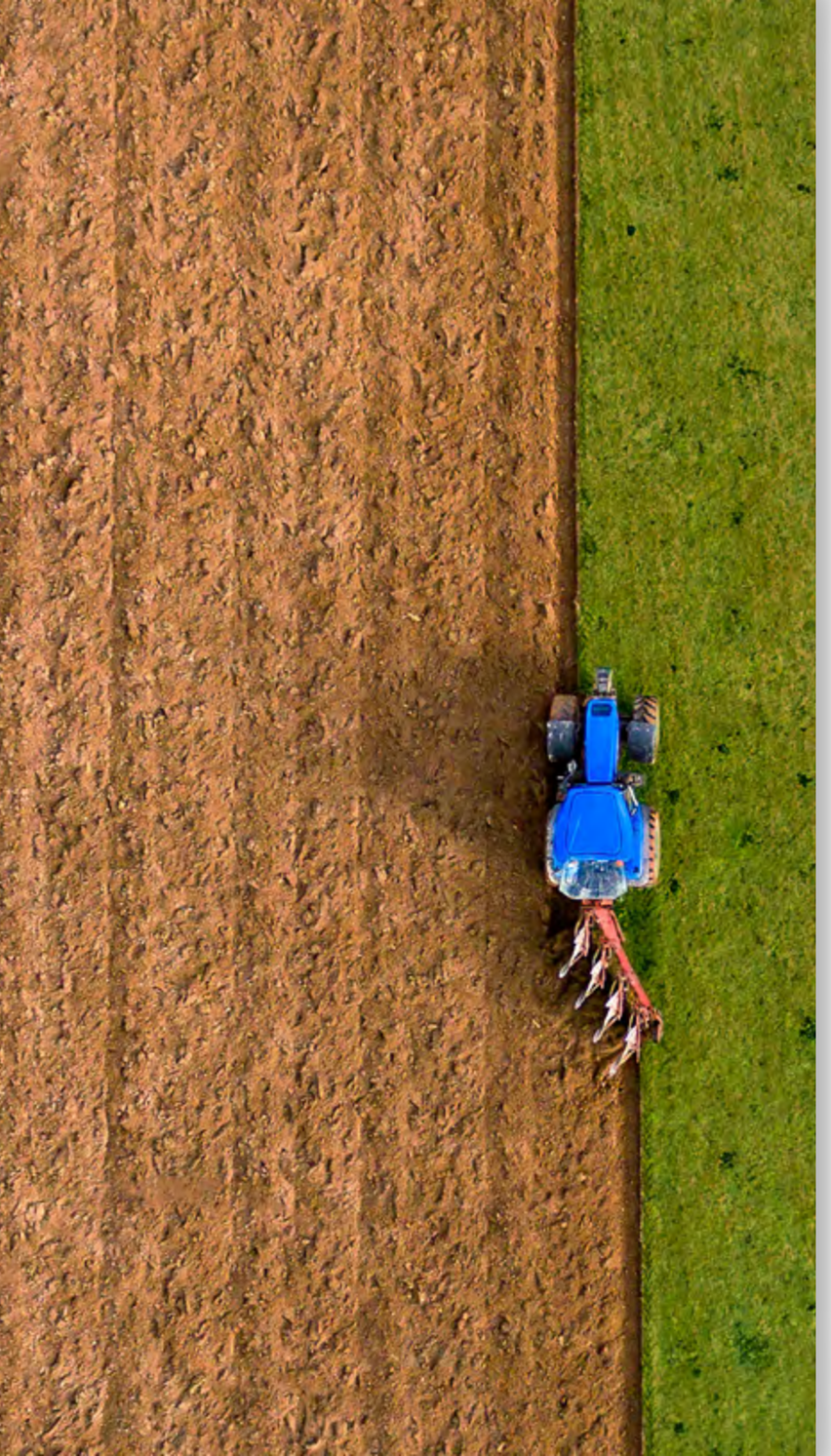

Ensuring Environmental Health, Optimizing Agricultural Production

Soil contamination and the assessment of its impact on human health, environmental well-being, and agricultural operations are critically important areas of environmental analysis and monitoring. Regulations are becoming increasingly stringent to protect all of us, and the list of harmful substances to test for is expanding – and that requires accurate, sensitive soil analysis solutions with very low detection limits. Whether you're concerned with nutrient testing or contaminant determination and remediation, we have the soil analysis solutions for your area of focus.

Our turnkey solutions come complete with:

- Analytical instrumentation
- Preset methods and workflows
- Consumables and accessories
- Informatics
- Service and technical support

From trace metals to VOCs and SVOCs to onsite soils analysis, we'll help you to get the job done, reliably, efficiently – and in compliance.

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Sources of Soil Pollution

NATURAL PROCESSES

Volcanic Eruption | Continental Dust | Weathering of the Earth's Crust | Soil Erosion | Urban Runoff

ANTHROPOGENIC PROCESSES

Mining | Combustion of Fossil Fuel | Agricultural Inputs | Governmental Operations | Industrial Discharge | Sewage Effluents | Air Pollution Fallout

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Critical Pollution Limits

Inorganic Limits

Items	China[1]	US[2]	Germany[3]	Japan[4]	Australia[5]
As	30	0.4	-	*15 mg/kg	100
Pb	80	-	40	0.01	300
Cd	0.3	70	0.4	*0.4 mg/kg	20
Cr	150	230	30	0.05 (VI)	100 (VI)
Cu	150	-	20	*125 mg/kg	6,000
Zn	200		60	-	7,400
Ni	60	1,600	15	-	400
Hg	0.3	23	0.1	0.0005	50
	-	1,600	?	Not detectable	250

1: Agricultural land, pH<5.5
2: Generic SSLs for residential scenario based on human health criteria only
3: Sandy soils
4. Hydrochloric acid leaching, mg/L; * for agricultural land
5. Health investigation levels for soil contaminants, residential A

Organic Limits

Category	Target Compounds	China[1]	US[2]	Australia[3]	Japan[4]
Halohydrocarbon	Carbon Tetrachloride	0.9/9	0.33	-	0.02
BTEX	Chloroforme	0.3/5	0.28	-	0.002
	Benzene	1/10	0.79	-	0.01
	Ethylbenzene	7.2/72	5.4	-	-
	Styrene		63000	-	-
	Toluene		5,000	-	-
	m&p-xylene		6,800	-	-
	o-xylene		3,800	-	-
Polycyclic Aro-matic Hydrocar-bon	Benzo[a]pyrene		0.015	-	-
Plasticizer	Bis(2-ethylhexyl) phthalate	42/420	35	-	-
Pesticide	Dichlorodiphenyl trichloro-ethane (DDTs)	6.5/66	5.1	600	-
			0.867	-	-

1: Risk screening values for soil contamination of development land (mg/kg): residence, schools, medicals, gardens
2: Screening level equation 6 and 7 for inhalation of volatile contaminants in residential soil (mg/kg)
3: Health-based investigation levels in residential soil (mg/kg)
4. Target level of soil quality examined through leaching and content tests (mg/L)

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Elemental Analysis

Heavy metals, including lead, copper, arsenic, and cadmium, are naturally present in soils, but they can negatively impact human and environmental health in combined or elemental forms at high concentrations. Whether the byproducts of industrial activities or the breaking down of soils and lead pipes, or deposited as acid rain, these elements are part of an environmental assessment of soil health. It's critical for environmental scientists to have reliable methods and instruments that can provide results in compliance with established regulatory methods and detection limits.

Application Highlights

- Read about NexION® ICP-MS systems for analysis of liquid and solid waste in water and soil following EPA Method 6020B.
- Learn more about multielemental analysis of soils using the NexION ICP-MS.
- Here are new approaches to meeting the challenges of soil analysis with the Avio® Max ICP-OES.
- Get more information about analysis of micronutrients by atomic absorption spectrometry.

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Organics Analysis

Volatile and semivolatile organic compounds (VOCs and SVOCs) are a large group of chemicals that includes dioxins, PCBs, pesticides, PAHs, MTBE, BTEX, carbonyl compounds, and others, which can be toxic and pose health or environmental concerns. Contamination of soils occurs through chemical spills and leaks, application of biosolids, natural disasters, and a host of other sources. Labs that analyze samples for VOCs and SVOCs can face a variety of challenges, including meeting regulatory criteria and maintaining sample throughput to generate data for timely decision making. That's why we equip scientist like you with workflows and solutions for a broad range of organic compounds, providing efficient, reliable, and robust data.

Application Highlights

- Read about how our Clarus® 690 GC/FID efficiently quantifies fuel oxygenates in a variety of matrices.
- Learn more about detection and determination of highly toxic VOCs.
- Read how we extended the hydrocarbon range of EPA Method TO-17 for soil gas above naphthalene and for fenceline monitoring.
- Read about extraction and analysis of target pesticides from soil samples using liquid injection into our Clarus SQ 8 GC/MS system.

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Analysis of Contaminants of Emerging Concern

Many environmental contaminants of emerging concern are compounds that originate in consumer goods such as human and veterinary medicines, personal care products, household cleaners, and lawn care and agricultural products. These contaminants enter surface water, groundwater, and soil, where they can accumulate in the food chain and have harmful effects on both human and environmental health.

The study of these compounds' effects, methods to remediate their impact, and the implementation of regulations related to their use and disposal all require analytical scientists to be equipped with flexible, robust testing solutions with low levels of detection.

Application Highlights

- Go deeper into FT-IR spectroscopy for the identification of polymers, with detection and identification of microplastics of only a few microns.
- Learn how a University of Birmingham team used a TGA-FTIR-GC/MS workflow to advance microplastics research.
- PFAS Health Concerns in Air, Water and Soil

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Radiochemical Analysis

Typically, radioactive particles are encountered at very low levels in nature and are present in different geological formations in soil and rocks. Sources for naturally occurring radioactivity include minerals containing radioactive elements, background cosmic rays, solar flux, radon gas, radioactive materials in manufacturing, nuclear medicines, and industrial operations such as nuclear power plants, nuclear laboratories, and radioactive waste handling and disposal. Regulatory agencies have set concentration limits, standards, and analytical testing methods to detect radioactivity in environmental matrices.

Application Highlights

- Read how our NexION ICP-MS reduces ^{90}Sr analysis time from 15 days to 14 minutes, key in monitoring large sample volumes following a nuclear incident.
- Learn how Fukushima University researchers developed the first map of radioactive contamination after the Fukushima Daiichi disaster.
- Learn more about liquid scintillation counting (LSC) technology.
- High sensitivity and unmatched detection of low-level Apha and Beta radioactivity

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Technology That Supports Your Science

Extraction and Analysis of Volatile Organic Compounds

Clarus SQ 8 and TurboMatrix™

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Soil Digestion Method

Titan MPS™ and SPB

LEARN MORE

Polycyclic Aromatic Hydrocarbons, Pesticide Residues, and Animal Residues

QSight® LC/MS/MS

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Combined Analysis or Organic Pollutants

TGA-IR

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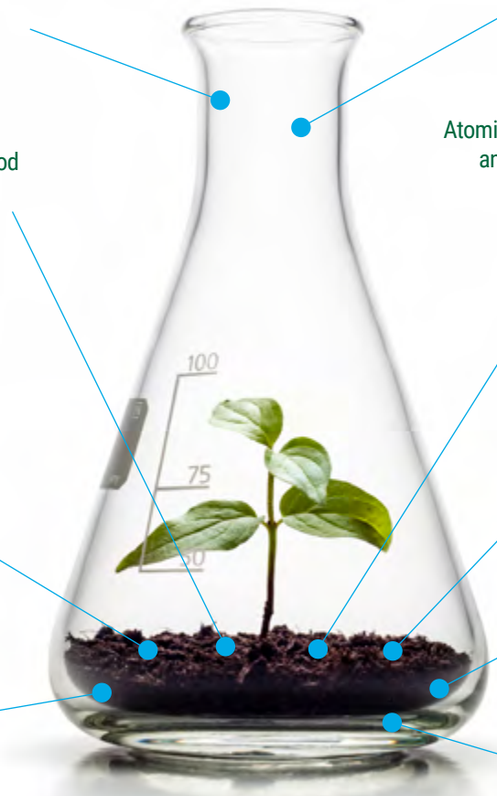

Real-time Rapid Analysis of Volatile Organic Compounds

Torion® T-9 portable GC/MS

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Atomic Spectra of Metal Elements and Some Nonmetal Elements

PinAAcle™ AA Spectrometer

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Multielemental Analyses

Avio Max Portfolio

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Trace Element Detection

NexION ICP-MS

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Radiochemical Analysis

Quantulus™ GCT

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Supporting The Business Of Science

In today's complex environmental regulatory landscape, every laboratory function must work together toward the goal of efficiency in the service of a more sustainable environment. That's the goal of OneSource® Laboratory Services, too. We deliver solutions that cover all aspects of scientific lab operations and can be customized for the scientific workflows – and business outcomes – you're driving toward.

OneSource is the one service organization with the requisite understanding of lab and R&D needs, delivering a customized systems approach to your success. With insights and expertise, our consultants pinpoint the issues and inefficiencies and engineer the right solutions to solve your scientific and business challenges. From everyday instrument repair and service to compliance and validation, from laboratory IT service to consulting and scientific staffing, OneSource Laboratory Services can help streamline your lab routines and get your scientists back to their main order of business – their science.

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For more information on our environmental solutions, visit www.perkinelmer.com/category/soil-and-solids-analysis

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