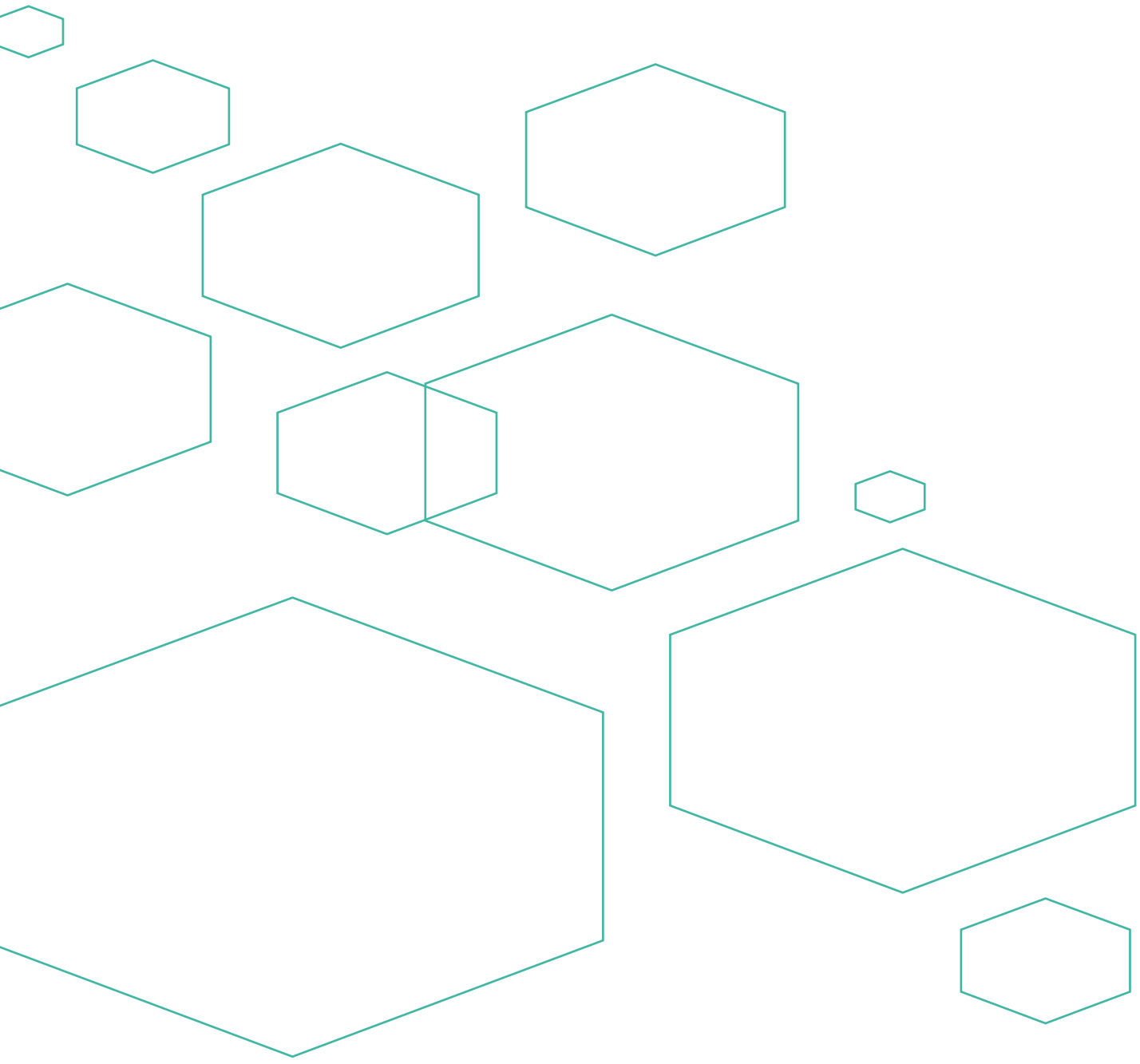
apc SA
SOLUTIONS



ENVIRONMENT

APPLICATIONS

SOIL AND ENVIRONMENTAL ANALYSIS

X-ray Fluorescence Spectrometry (XRF) is a quick method for determining of the total elemental composition of soil samples. Unlike many laboratory techniques, XRF does not require any acid digestion techniques before the sample is analyzed, therefore it can be a useful screening tool. As this technique is subject to a number of analytical interferences and analytical errors, the results of XRF investigations should only be used to undertake qualitative or semi-quantitative investigations of a contaminated site.

The analysis of soil for contaminant metals is the most common environmental application of handheld X-ray fluorescence spectrometry. Simple screening for toxic metals is performed by placing the analyzer directly on the soil, in-situ.

Screening Level Assessments

Screening level assessments are a rapid, non-rigorous site investigation method, which does not offer a definitive quantification of the concentration of the elements present. Typically, screening level assessments are used to:

- Identify potential hotspots on a site,
- Provide an indication of the extent of contamination,
- Provide preliminary identification of contaminants present,
- Assist with remediation decision making,
- Assist with screening of hazardous waste.

Screening level assessment should be undertaken in accordance with the requirements of ISO-13196 as a minimum.

Factors Affecting XRF Analysis

Inferences in X-ray fluorescence are due to spectral line overlaps, matrix effects, spectral artefacts, soil moisture and particle size or mineralogical effects.

Depth of X-ray penetration

X-ray fluorescence is a surface analysis technique, with the X-rays only penetrating between 2 and 5 mm into the sample. Therefore, if the soil being analyzed is covered by a thin layer of clean soil or organic matter then the measurement of the sample may not be representative of the bulk of the underlying soil.

On-site analysis

While XRF can measure undisturbed soil directly, it is recommended that a minimal soil preparation protocol is followed. On-site XRF measurements should be used for qualitative or semi-quantitative purposes only.

Analysis of a Standard Reference Material

Analysis of a standard reference material. Reference material should be selected containing the elements of interest and covering the concentration range of interest. Additionally, where available, reference materials with a similar composition of the samples under investigation should be selected. For XRF to be considered accurate, the measured value should be within 20 % of the certified value for the reference material (for chromium and nickel ± 30% is acceptable). The percentage difference between the certified and measured value of the reference material can be calculated using the following formula:

%D = Percent difference
C_k= Certified concentration of standard sample
C_s= Measured concentration of standard sample

$$\%D = \left(\frac{C_s - C_k}{C_k}\right) x\ 100$$

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