

RISK ASSESSMENT

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Client's Guide to Contaminated Land Risk Assessment

Contaminated land risk assessment is a complex subject. To some, it may appear as a black art, but provided competent practitioners conduct it, it helps towards the robust and sustainable management of risk from land contamination. **PAUL SHEEHAN** BSc (Hons) MSc MEnvSc, Associate Director, Environmental Engineering Group and **SIMON FIRTH**, Firth Consultants, provide a brief introduction to risk assessment with a view to informing those commissioning this type of work.

There are currently two key pieces of policy that require risk assessment of potentially contaminated land. The principal legislation is Part IIA of the Environmental Protection Act 1990 introduced in 2000. This requires local authorities to identify existing sites that, as a result of contamination, pose an unacceptable risk to human health or the environment. Such sites may then be determined as 'contaminated land' and steps should be taken to reduce the risks to acceptable levels.

Although the identification and remediation of contaminated land in this way is an important element of many local authorities' work, a vast majority of contaminated sites are dealt with through the planning process. For developers, the key policy is Planning Policy Statement 23 (PPS23), which employs the "suitable for use" approach. Developers

have to satisfy the local authority planning department that contamination at the site will not pose an unacceptable risk to humans or the environment during or after redevelopment. In other words, they must be confident that the development could not be determined as contaminated land. When carried out by a competent practitioner, risk assessment helps to define the need and extent of remediation or other risk-mitigation alternatives that are required to ensure safe development.

RISK ASSESSMENT METHODOLOGY

The Part IIA statutory guidance states that there are two steps in applying the definition of contaminated land:

- Identification of potential source-pathway-receptor combinations – pollutant linkages;
- Assessing risk to receptors from these pollutant linkages.

Further guidance on this process is provided in the

Defra and EA CLR1 1 Model Procedures document which provides the framework for conducting contaminated-land risk assessment in the UK. Demonstration that the framework has been followed will help to satisfy a local authority that the conclusions of the risk assessment are valid. The CLR1 1 document recommends a tiered approach to risk assessment:

- Tier 1:** Preliminary Risk Assessment;
- Tier 2:** Generic Quantitative Risk Assessment (GQRA);
- Tier 3:** Detailed Quantitative Risk Assessment (DQRA).

The tiered approach streamlines the risk-assessment process, focusing effort on areas where risks are potentially unacceptable. This is essentially an iterative process where the earlier the exit from the process, the higher the likely remedial costs.

Further work should allow a more accurate **cont..**

RISK ASSESSMENT



cont.. assessment of risks and often results in a decrease in remediation costs. However, there comes a point when the costs of additional work outweigh the benefits. Advice from an experienced risk assessor with a good understanding of remediation and other risk-mitigation techniques helps to ensure that the best decision is made. The involvement of other key stakeholders, such as the client, the local authority and the environment agencies in this decision can also help to ensure safe development in a timely and cost-efficient manner.

PRELIMINARY RISK ASSESSMENT

A key component of the preliminary risk assessment is the development of a conceptual model of risk for the site. The conceptual model underpins the whole risk-assessment process and should be updated as the project proceeds. The principal of the conceptual model is that there must be at least one source, receptor and pathway linking them for it to be a risk. These source-pathway-receptor combinations are known as pollutant linkages and there are often many constituting the conceptual model.

The development of the conceptual model should start at the desk-study stage. Information about the site's history, surrounding land use and environment is collected and used to identify potential contaminant sources, pathways and receptors for the site. The conceptual model should identify the key uncertainties and data gaps, which, in turn, are used to inform the site investigation design and further stages of risk assessment. This helps to ensure that the site investigation provides the necessary information for informing later decisions for minimum time and cost.

GENERIC QUANTITATIVE RISK ASSESSMENT (GQRA)

GQRA involves the comparison of contaminant concentrations measured in soil, water or soil gas at a site with generic assessment criteria. Generic

assessment criteria are typically conservative to ensure that they are applicable to the majority of sites and normally apply to only a limited number of pollutant linkages.

The uncertainties and limitations associated with the generic assessment criteria must be understood to ensure that they are used appropriately. Firstly the generic assessment criteria should be suitable for use in the UK. The Soil Guideline Values (SGV) are examples of generic assessment criteria that can be used to assess the risk to humans from contaminants in soil, while the UK drinking water standards or environmental quality standards are useful generic criteria for assessing the risks to controlled waters.

Prior to the introduction of SGV and CLEA methodology, practitioners had relied on 'look-up tables' such as the ICRL and Kelly's Values to determine the need for remediation on sites. These values no longer conform to current guidance and should therefore not be used. However, to date, there are SGV for only ten contaminants and so many consultants have developed their own sets of generic assessment criteria to fill the SGV gap. The validity of these criteria is dependent on the level of effort to make these UK compliant. Whilst many practitioners have developed or use criteria that are robust and scientific conforming to available guidance, there are still cases where inappropriate criteria are used and this compromises the validity of the risk assessment. Use of a competent practitioner will ensure that the risk assessment is valid, thus easing the path to regulator acceptance.

Secondly, the generic assessment criteria should only be used for the purpose for which they were intended. For example, comparison of the SGV for residential land-use with soil concentrations at a site cannot be used to assess risk to controlled waters, nor can it be used to assess risk to a utility worker involved with excavations at the site.

DETAILED QUANTITATIVE RISK ASSESSMENT (DQRA)

DQRA makes greater use of site-specific data to conduct a more accurate assessment of risks. DQRA often involves the use of models to derive site-specific assessment criteria (SSAC) that are then compared with measured concentrations in soil, water or soil gas at the site to estimate risk.

The Contaminated Land Exposure (CLEA) methodology was developed in the UK to derive the SGV, but can also be used to derive SSAC to aid the assessment of risks to human health from soil contamination. Many other models are available for assessing risks to human health, groundwater and ground gas. The choice of model will be dependent on the particular circumstances on a site. It is advisable to check whether the relevant regulator will accept the chosen model prior to use. Again, the choice of model will be dependent on the circumstances at the site and the requirements of the regulator.

DQRA by nature is complex and a good understanding of the assumptions and algorithms used for the modelling, together with an appreciation of the uncertainties, is required to ensure that the results are valid and are interpreted correctly. Incorrect input parameters can lead to orders of magnitude errors in the results and could lead to unnecessary remediation or unacceptable risks being wrongly discounted. Similarly, a lack of appreciation of the uncertainties can give a false sense of security in the results and lead to ill-informed decisions on risk management. For these reasons, the use of companies with appropriate knowledge and skills is particularly important when conducting DQRA.

UNCERTAINTY

Uncertainty is a key component in risk assessment – but arguably it is uncertainty in guidance that is currently posing the greatest challenge to risk assessment in the UK. As discussed, the definition of contaminated land is partly based on the presence of unacceptable risk. For human health, there is currently controversy over what is meant by "unacceptable". The SGV have been developed on the basis of acceptable risk, which unfortunately does not fit with the definition of contaminated land. There is currently a fundamental difference of opinion over what constitutes unacceptable harm to human health. There is still no clear agreement on this issue between DEFRA and the key agencies advising it, and there is uncertainty over how long these issues will take to resolve.

Until the current controversy is resolved and the poor practice by some eradicated, these issues will continue to frustrate local authorities, land owners, developers and competent consultants in their attempts to deal with land that may be affected by contamination in a cohesive, robust, cost-effective and timely manner.