



## **ENVIRONMENT AGENCY'S FRAMEWORK FOR ECOLOGICAL RISK ASSESSMENT OF CONTAMINATED LAND**

### **ENVIRONMENT AGENCY – ENERGY INSTITUTE – SAGTA WORKSHOP**

**4 DECEMBER 2008, ENERGY INSTITUTE, LONDON**

#### **1 SUMMARY**

A workshop on the Environment Agency's Framework for Ecological Risk Assessment of Contaminated Land (chaired by Dr Dan Osborn, NERC) was held on 4 December, 2008 at the Energy Institute, London. The aim was to introduce the framework and discuss challenges to its implementation. Delegates were introduced to the topic via a series of presentations by key stakeholders. Subsequent discussions identified four key issues that were explored in breakout groups:

- Prioritisation of sites/baselines
- Soil screening values (SSVs)
- Exiting from the framework– cause-effect attribution and conflicting results
- Risk management measures monitoring and end points

The key conclusions were as follows:

- The tiered Framework takes a logical and systematic approach ecological risk assessment.
- It is anticipated that many industrial sites will exit the framework following the development of a Conceptual Site Model (confirming no plausible source-pathway-receptor linkages).
- The limited number of SSVs and their conservative nature could result in Tier 1 acting as a funnel rather than a sieve, thereby delaying the identification of sites posing real ecological risks.
- SSVs must be applied and interpreted as intended i.e. as screening values, not remediation goals.
- The potentially longer timescales of ecological risk assessment compared to human health risk assessment are likely to be incompatible with the much shorter site acquisition and divestment timescales. How can this be addressed?
- The Framework needs to be complemented with other tools such as guidance on practical risk management measures / remediation end-points and cost:benefit analysis.
- Experience with ecological risk assessment of contaminated sites in the UK is limited. There is a need for training, accreditation of service providers and a forum to exchange experiences between various stakeholders.

- Clarity is sought on issues pertaining to future liabilities for sites having been remediated on the basis of ERA.

It was agreed to that links between industry practitioners, EA and other stakeholders should be strengthened to facilitate joint learning and dissemination of data/experiences. A second workshop is planned for 2010 to share further experiences.

## **2 INTRODUCTION**

Development of the Environment Agency's Framework for Ecological Risk Assessment of Contaminated Land began in 2003. Several members of the EI and SAGTA contributed to the development by undertaking 'road testing' exercises at their sites to assess practicability and sharing experiences. The public consultation on the proposed framework culminated in a workshop in March 2006 to collate and analyse all the feedback. The framework was revised in the light of feedback from all these activities and was launched at the Royal Society in London on the 15th October 2008.

On 4 December 2008, the Environment Agency, Energy Institute and SAGTA held a joint workshop under the Chairmanship of Dr Dan Osborn (NERC) with the aims of:

- Introducing the framework to participants
- Identifying specific challenges to implementation
- Discussing potential solutions to selected challenges
- Identifying opportunities where the EA, SAGTA and the EI can work together in the future to facilitate successful implementation of the framework.

The workshop was attended by 30 delegates representing the Environment Agency, nature conservancy authorities, environmental consultants and EI/SAGTA membership (petroleum, nuclear, chemicals, steel, construction industries etc.). The absence of Local Authority representatives was noted, and it was considered that as the framework is disseminated more widely, interest would increase.

## **3 FEEDBACK**

A combination of presentations, break out sessions and plenary session were utilised to explore the topic and issues that arose. Themes for breakout sessions were identified as: [1] Prioritisation and baselines; [2] SSVs; [3] Exiting from the framework; and [4] Risk management measures, monitoring and end points

Key feedback from the presentations and breakout sessions is summarised below.

### **3.1 General**

The framework only applies to protected sites listed in the Statutory Guidance (to Part IIa of EPA 1990), but it has been designed so that it may be used with other regulatory regimes such as the Birds and Habitats Directives. It is designed to use best practice in risk assessment to be sure benign sites are excluded early and offers a tiered system for risk assessment: initial desk study and Conceptual Site Model production; Site investigation and chemical – specific assessment against Soil Screening Values (Tier 1); Detailed quantitative risk assessment: using laboratory bioassays and/or eco-surveys at the site (Tier 2); and cause & effect attribution (Tier 3). Activities are site specific and the key is to engage all relevant stakeholders in the assessment. The group noted that this was of particular importance when considering SPOSH [significant possibility of significant harm] since adverse change is not defined in the framework and requires expert judgement.

Local Authorities are responsible for enforcing Part IIa, but it was generally acknowledged that they would prioritise human health and controlled waters above ERA. Limited resources in local authorities mean that sites may be determined for eco-risk on limited assessment using a precautionary approach. This could prove problematical for all stakeholders. It is expected that the framework will be primarily used on a voluntarily basis by organisations taking a responsible approach to environmental risks. ERA is not new to companies especially those operating in ecologically sensitive parts of the world.

It was considered that many industrial sites would be screened out at the CSM stage (no plausible source-pathway-receptor linkages identified). At this stage it is important to consider the likely migration pathways for the contaminant of potential concern and the role of natural attenuation (in groundwater) and biodegradation (at the surface/groundwater interface) These mechanisms significantly restrict travel distances and the potential for source-pathway-receptor linkages.

There was concern over the lack of sufficient ecological risk assessment expertise within land owners, environmental consultancies and local authorities. The EA propose that this could be overcome by wider stakeholder engagement and that once a potential risk pathway is identified expert help should be sought. It was agreed that training was needed to ensure the framework was applied as intended. The group was advised of various organisations for professional ecologists (inc. accreditation bodies\*).

- Institute of ecology and environmental management (<http://www.ieem.org.uk/>)\*
- Institute of environmental management and assessment (<http://www.iema.net/>)\*
- British Ecological Society (<http://www.britishecologicalsociety.org/>)

### **3.2 Prioritisation/baselines**

A large company owning numerous sites will need to prioritise (rank) sites for ecological risk potential. The Conceptual Site Model is key here to identify the likelihood of a source-pathway-receptor linkage based on such information as proximity to potential receptor, mobility of contaminant, geology etc. Details pertaining to the designation status of a potential receptor (e.g. who awarded designation and for what purpose - types of species) can be obtained from regulatory authorities such as Natural England. . It was proposed that data be digitised and put in a GIS database. It was noted that Natural England allocate status to each site – i.e. favourable condition or unfavourable. Details can be found on the Natural England website <http://www.naturalengland.org.uk/> .

The need for an ecological baseline was identified and links were made with requirements under the Environmental Liabilities Directive (2004/35/EC – due to be transposed into UK SI by December 2008). Challenges in finding adequate historical data or an equivalent uncontaminated land area to use for baseline comparisons were noted.

### **3.3 Soil screening values (including background levels)**

There was much interest in the role of SSVs in ERA. SSVs are screening values, i.e. not intended to be used as remediation goals. They are based on the 95% confidence interval; they do not take additive effects into account.

Currently, SSVs are only defined for 12 chemicals (mainly metals), although it is anticipated that the list will be extended in the future. Screening values for chemicals for which SSVs have not yet been determined can be taken from a list of preferred sources if the derivation method is appropriate for the site and with the agreement of all stakeholders. If the SSV is exceeded, then the assessment must progress to Tier 2. All stakeholders should be consulted on proposed follow up action.

The limited number of SSVs and their conservative nature could result in Tier 1 acting as a funnel rather than a sieve, thereby delaying the identification of sites posing real ecological risks.

Where a site is located adjacent to a designated area, sampling should be carried out within the designated area (i.e. at the point of perceived risk to the receptors) wherever possible, to avoid the reliance on conservative transport models. Practical challenges (e.g. delineation of, access to and sampling in SSSIs) were identified.

It was noted that contamination may be the impetus for the colonisation of a particular area by a protected species due to factors such as lack of competition or provision of a food source (e.g. algal bloom) It was noted that SEPA had addressed this in guidance that requires a test of relative harm of action vs. no-action.

To note: EA is currently consulting on 12 SSVs; the consultation will end 31 March 2009. Details can be found at: <http://www.environment-agency.gov.uk/research/library/consultations/96836.aspx>

### **3.4 Exit**

A key issue was identified as being the potential for a 'catch 22' situation i.e. where a site has been designated due to the presence of a particular species which is there because of the contaminant; it would be detrimental to remediate that site to pristine conditions. For such cases it was suggested that comparisons be made with the conditions at the time of designation (i.e. baseline). Similarly there was concern that all areas with elevated background concentrations could be progressed unnecessarily to Tier 2.

- Tier 1 – low level SSVs will mean that very few sites are screened out. Further sampling in local uncontaminated areas of similar soil characteristics (agreed by all stakeholders) can be used to determine whether the measured levels are background in a given area. It was suggested that a review of the raw data behind SSVs (e.g. consideration of safety factors; and applicability of assumptions on a site specific basis) may provide evidence that application of SSVs is overly conservative for that particular case.
- Tier 2 – care must be taken wrt the suitability of bioassays. Those selected must be appropriate for the species/environment under investigation. The quality of data obtained from an eco-survey will be dependent on its design. Care must be taken that natural variations (e.g. seasonal) are not erroneously identified as adverse effects (see Tier 3).
- Tier 3 – Having identified the ecosystem, contaminant of concern and an effect a causal link still has to be established. Effects could be due to factors other than the contamination (e.g. decline in bird population – hedgerows have been cut). At this stage the local authority must secure expert advice.

The timescales to undertake eco-surveys and establish baselines are likely to be incompatible with site acquisition and divestment timetables. It was felt that significant forward planning would be needed to manage this.

### **3.5 Sampling and analysis**

It was noted that the soil structure and contaminant distribution will be heterogeneous, presenting difficulties in identifying suitable representative sampling points for both contaminated and uncontaminated (baseline) areas. Stakeholders (inc. ecologists) should be consulted when designing a sampling strategy to ensure its appropriateness for the site/ecology. It was suggested that Environmental Quality Standards (EQS) be utilised for surface water screening. However the group acknowledged the absence of equivalent guidance for pore waters.

Concerns were raised over the appropriateness of certain bio-assays. It was noted that bioassays were originally developed for agricultural top soil not made ground. Limitations of using bioassays include recognising potential differential between indicator species improvements and true improvements to target species. It was suggested that monitoring and measuring trends (e.g. eco-surveys) would provide a more appropriate measure of ecological improvement.

### **3.6 Assessment of end points/remediation**

SSVs are not remediation goals. The science of ecological risk assessment is not sufficiently well developed to enable the calculation of site specific target concentrations as in human health risk assessment. So in the absence of the ecological equivalent of site specific quantitative remediation goals how should the end – point of a remediation be judged and how should progress towards it be monitored? It is likely that contaminant concentrations will be reduced below levels that cause ecological damage long before the protected species recover. Carefully selected bioassays may have a role to play here, but technical guidance is clearly required to ensure that remediation activities are not prolonged unnecessarily. The difficulty in taking corrective action in the absence of a quantitative site specific clean-up goal was acknowledged and the EA agreed to discuss the practicality of producing guidance in this area. The group agreed it was not desirable to retain open-ended and on-going liabilities. Practical guidance on dealing with liabilities, inc. transfer of (e.g. by bond or endowment); and apportionment of shared liabilities was requested as important addition to the ERA toolbox. Guidance on risk management solutions was also identified as key to ensure the existing framework is appropriately implemented. Without this additional guidance the framework provides a tool to identify problems, but not solutions.

## **4 NEXT STEPS**

- The need to capture experiences was identified and supported, i.e. examining case studies and how they were managed, focussing on lessons in good practice and failures. In pursuit of this, information on a series of recently published papers which describe the US EPA eco-risk approach and reflect on experience of its application will be circulated to attendees.
- The group expressed a desire to participate in an on-going forum to allow for the transfer of information. Options for this will be considered once the framework is more established and contributors have practical experiences to share.
- It was agreed that guidance on risk management methods and determination of remediation end – points and cost-benefit analysis was desirable and development would benefit from industry-EA partnerships.
- The need for training and accreditation was recognised and delegates were provided details of appropriate professional organisations.
- A follow-up workshop is planned in 12-18 months time which will provide a forum for common experiences and facilitate joint learning by focusing on case studies.