Guidance on characterising, assessing and managing risks associated with potentially contaminated sediments

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May 2013

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This publication has been produced as a result of work carried out within the Technical Team of the EI, funded by the EI's Technical Partners. The EI's Technical Work Programme provides industry with cost-effective, value-adding knowledge on key current and future issues affecting those operating in the energy sector, both in the UK and internationally.

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The EI gratefully acknowledges the financial contributions towards the scientific and technical programme from the following companies

BG Group
BP Exploration Operating Co Ltd
BP Oil UK Ltd
Centrica
Chevron
ConocoPhillips Ltd
Dong Energy
EDF Energy
ENI
E. ON UK
ExxonMobil International Ltd
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Shell U.K. Exploration and Production Ltd
SSE
Statkraft
Statoil
Talisman Energy (UK) Ltd
Total E&P UK Limited
Total UK Limited
Valero
World Fuel Services
Vattenfall

However, it should be noted that the above organisations have not all been directly involved in the development of this publication, nor do they necessarily endorse its content.

ISBN 978 085293 646 4

Issued by the Energy Institute

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ACKNOWLEDGEMENTS

This project was commissioned by the EI's Soil Waste and Groundwater Group.

The Energy Institute wishes to record its appreciation of the work carried out by ARCADIS EC Harris, UK.

The production of these guidelines has been steered within a cooperative EI and CONCAWE approach with respective representatives on the steering boards. The EI wishes to record its gratitude for the valuable contributions made by members of the Soil Waste and Groundwater Group and members of the CONCAWE Water, Soil & Waste Management Group (WSWMG - STF/34) during development of this document.

Martyn Lambson	BP
Klaas den Haan	CONCAWE
Beate Hildenbrand	EI
Martyn Dunk	Exxon Mobil
Ruth Chippendale	Shell
Jonathan W. Smith	Shell
Paola Franchi	Rontec

In particular the EI would like to acknowledge Katy Baker, Philip Spadaro, Simon Hay and Cecilia MacLeod (ARCADIS) as the principal authors and express its thanks to them.

The EI and the authors are also grateful to Brent Brinkman, Haayo Spoelstra, Vito Schifano, Chris Day, Paul Doody, Stuart Messur, Bob Romagnoli, Magdalena Pachocka, Jürgen Thomas and Joseph Germano for their contributions.

EXECUTIVE SUMMARY

This publication draws together experience and learning from more than twenty years of investigation, assessment and remediation of sediment sites affected by contamination from across the globe, with a focus on the European Union (EU). The aim of the document is to provide an introduction to sediments, why contaminants may be present in sediments and the potential risks contaminated sediments can pose to human receptors, aquatic organisms and the wider water environment. The publication is split into sections providing: information and advice on the legislative and regulatory frameworks governing the assessment of sediment sites affected by contamination; an overview of a tiered assessment process which can be adopted; design of investigation strategies including selection of investigation tools; risk assessment tools, and remediation solutions. The publication builds upon existing guidance documents, including those developed by individual EU member states and those developed in other countries such as the United States of America.

Underpinning the publication is a recommended definition for contaminated sediment, developed on the basis that a risk-based approach should be used to identify sites where contaminants present in sediment are causing, or are likely to cause, lasting environmental damage or harm. This mirrors the approach commonly adopted by the land contamination community, where the presence of a contaminant in an environmental medium does not constitute a contaminated site unless a significant source-pathway-receptor linkage can be identified.

Recommendations are made throughout the publication to aid the reader in reaching a conclusion as to the most suitable methods for investigation, risk assessment and remediation on a site-by-site basis. The final section in the publication focuses on remediation solutions designed to manage the source, pathway or receptor, highlights the importance of considering source control as part of the remediation strategy, and documents key points of learning from a review of global experience in the risk management of contaminated sediment sites.

1 INTRODUCTION

Contaminated sediments are becoming more widely considered throughout the world. As recently as one decade ago, the countries with regulatory systems directly applicable to the management of contaminated sediments were minimal. Now, at least 35 countries have some type of regulatory framework or guidance for dealing with contaminated sediments (Spadaro, 2010). In a number of countries, including those in the EU, efforts to better understand and manage the risks from contaminated sediments are underway; although it is recognised that both inland and coastal water quality in many member states has increased over the past 30 years, and continues to increase, in part due to improvements to pollution prevention control and monitoring (e.g. European Environment Agency, 2010).

Much of the regulatory effort and some of the actual risk mitigation and remediation strategies associated with contaminated sediment management lack rigorous scientific underpinning. This can lead to remediation being implemented where a more robust assessment of risks would result in the conclusion that remediation is not warranted. Further, while in a limited number of locations there is evidence for degradation in water quality or bioaccumulation of contaminants within the aquatic food chain which may be attributable to contaminants in sediments, for many other locations there is limited or no evidence of lasting damage to the aquatic environment due to the presence of contaminants in sediments.

At waterfront sites, sediment contamination can represent a reasonably small-scale issue; for example, contamination present in sediments proximate to a site as a result of contaminated groundwater discharge. At the other end of the extreme, sediment contamination can represent a large-scale issue, where an entire river system has been affected as a result of discharge or waterway management activities. The sediment system is a dynamic environment which is ever-changing and any investigation approach needs to account for this dynamism in order to allow for appropriate data interpretation, risk assessment and remediation. This makes the robust assessment as to the actual risks presented critical to ensure that decision-making is based on sound principles and takes into account the sustainability of implementing a remediation strategy.

Key issues regarding the investigation, assessment and remediation of sediment sites affected by contamination are shown on Figure 1.1, helping to explain why the management of these sites is a complex area requiring multi-disciplinary input.