# TECHNOLOGY AND RESEARCH GROUP

# TWELFTH ANNUAL REPORT
# 2013

## Introduction by the TRG Chairman

*I am pleased to say that the TRG members were kept busy in 2013. The work programme included the review of 3 CL:AIRE project applications plus 7 bulletins and the answering of a number of technical queries.*

*Since the TRG provides independent strategic peer review, support and technical steering functions in support of CL:AIRE's activities, a high workload indicates the continued success of CL:AIRE. Further, the TRG is fundamental to maintaining and enhancing CL:AIRE's reputation and supporting the development of the organisation.*

*I know that the CL:AIRE Board and Management Team greatly appreciate the time and effort taken by the TRG members in ensuring the quality of CL:AIRE products and supporting future developments. I would also like to express my personal thanks to the TRG members and their employers for their contributions and I look forward to a productive 2014.*

*This document is in two parts - the first gives background to the important role of the TRG within CL:AIRE, whilst the second details our activities during 2013.*

Mike Summersgill
January 2014

# BACKGROUND TO CL:AIRE AND THE TRG

## INTRODUCTION

CL:AIRE was established as a public/private partnership in March 1999, to facilitate the field demonstration of remediation research and technology, including innovative methods for site characterisation and monitoring, on contaminated sites throughout the UK.

CL:AIRE's status as an independent organisation allows it to appraise and disseminate on innovation in remediation, increasing confidence across the entire industry and driving forward the effective remediation of contaminated land.

CL:AIRE is a registered charity and an environmental body registered with ENTRUST. It is also an incorporated company, limited by guarantee and registered in England and Wales.

CL:AIRE consists of a small team of professionals who carry out its daily activities, supported by a Board of Trustees and an advisory group – the Technology and Research Group (TRG). The TRG takes a key role in CL:AIRE's work, supporting CL:AIRE on issues associated with technology development, providing guidance on issues relating to contaminated sites and offering strategic review and steering functions for all CL:AIRE's activities.

## CONTEXT

CL:AIRE's reputation in the market place is for the dissemination of information and, in particular, the publication of high quality, peer reviewed, impartial and technically scientific robust reports. The TRG ensure the real added value to CL:AIRE. This is due in large part to two things:-

- the TRG process – which ensures consistency with UK policy and legislation, an appropriate scientific and technical quality of work, and transparency; and
- the TRG members – who are high calibre renowned experts in their field.

## THE TRG PROCESS

The TRG review process works through a number of communication routes including meetings, conference calls and email exchanges.

The process comprises a detailed evaluation of project and publication submissions in terms of the scientific validity of the application and the robust nature of the methodology. The process does allow for constructive feedback and resubmission, but not all applicants get through.

## TRG MEMBERS AT END OF 2013

**Chairman:** Mr Mike Summersgill – SEnSe Associates
Deputy Chair: Dr Brian Bone – Bone Environmental Consultant
Deputy Chair: Mr Steve Edgar – Vertase FLI
Mr Bob Barnes – Environment Agency
Dr John Campbell – SAC Associates
Professor Max Coleman – Caltech
Professor Mark Hodson, University of York
Dr Theresa Kearney – Northern Ireland Environment Agency
Professor Phil Morgan – The Sirius Group
Mr Richard Moss – AkzoNobel
Mr Mike Pearl – Cavendish Nuclear
Dr Mike Rivett – University of Birmingham
Professor Jonathan Smith – Shell Global Solutions
Dr Steven Thornton – University of Sheffield

# THE 2013 ANNUAL REPORT

## 1. TRG ACTIVITIES

### 1.1 TRG Meetings

During 2013, four TRG meetings were held.

### 1.2 Project Applications Reviewed

The TRG reviewed one technology demonstration project application and two research project applications during 2013. The table below provides a general description of the type of project submitted and the status of its review.

| Project Area | Demonstration (D) or Research (R) | Decision Made |
|---|---|---|
| Chemical oxidation | D | Approved as TDP32 - In Situ Chemical Oxidation of Carbon Disulphide Using Activated Persulphate |
| Phytoremediation | R | Approved as RP25 - Cleaning Land for Wealth (CL4W) |
| Site investigation, chemical oxidation | R | Under review, awaiting further information |

The current status of CL:AIRE Technology Demonstration Projects (TDP) and Research Projects (RP) is provided in Appendix 1.

### 1.3 CL:AIRE Publications Reviewed

*1.3.1 Bulletins*

TRG members reviewed 7 bulletins during 2013, 5 of which were published and 2 of which are due to be published in early 2014 (shown in italics below):

| Bulletin Type | Bulletin No. | Bulletin Title |
|---|---|---|
| Case Study | CSB11 | Remediation of Four Sites in Northwest England: A Successfully Completed Multi-Site, Multi-Consultant Cluster Project |
| SuRF-UK | SuRF1 | Sustainability Assessment: Shell Terminal Facility, Madeira |
| SuRF-UK | SuRF2 | Upper Heyford - Remediation Options Appraisal |
| SuRF-UK | SuRF3 | Helpston Contaminated Land Project |
| Treatability | TrB3 | Chemical Oxidation |
| *TDP* | *TDP25* | *Decision Support Tool for Innovative In Situ Multi-Contaminant Groundwater Remediation* |
| *Treatability* | *TrB4* | *Soil Vapour Extraction* |

The current status of CL:AIRE Publications is provided in Appendix 2.

### 1.4 Other Activities

In addition to the above activities the TRG were asked to comment on, or contribute to, many of CL:AIRE's initiatives (listed in Appendix 3). Further contributions included the following:

- Review of a profile on the history and operation of gasworks
- Helping to develop a webinar policy for CL:AIRE
- Development of new module of risk communication eLearning
- Attending the NICOLE meeting on liability management from a financial, legal, and insurance perspective
- Attending the SOBRA Winter Conference

## 2. A LOOK AHEAD TO 2014

Building on the achievements of 2013, a new wave of CL:AIRE outputs is predicted for the forthcoming year. The TRG will be reviewing a number of new bulletins, the final gasworks profiles, the LNAPL Handbook, the outputs from the SuRF-UK phase 3, a bulletin on the management of mercury contamination as well as contributing strategic review, support and steering functions for CL:AIRE's activities.

This document was prepared by Dr Rob Sweeney, Project Director, CL:AIRE on behalf of the TRG.

Appendix 1

**Status of CL:AIRE Technology Demonstration Projects**

| Code | Project Title and Project Operator | Status |
|---|---|---|
| TDP 1: | Remediation Trial Using Low Temperature Thermal Desorption to Treat Hydrocarbon Contaminated Soil - British Aerospace Systems | Completed + Report Available |
| TDP 2: | Remediation of Basford Gasworks Using Soil Washing – National Grid Property/VHE | Completed + Report Available |
| TDP 3: | Design, Installation and Performance Assessment of a Zero Valent Iron Permeable Reactive Barrier in Monkstown, Northern Ireland- Nortel Networks/Golder Associates/Queen's University Belfast/Keller Ground Engineering Ltd | Completed + Report Available |
| TDP 4: | Slurry-Phase Bioreactor Trial - Parsons Brinckerhoff/National Grid Property | Completed + Report Available |
| TDP 5: | A Reducing and Alkalinity Producing System (RAPS) for Passive Treatment of Acidic, Aluminium Rich Leachates from Mine Spoils - University of Newcastle/Durham County Council | Completed + Report Available |
| TDP 6: | Bioremediation Trial at The Avenue - DEC NV/Jacobs/East Midlands Development Agency/Homes and Communities Agency | Completed + Report Available |
| TDP 8: | Field Demonstration of Accelerated Carbonation Technology (ACT) at The Avenue – Jacobs/East Midlands Development Agency/Homes and Communities Agency | Completed + Bulletin Available |
| TDP 9: | Use of an Air Sparge Treatment Curtain to Remediate Groundwater at a Former Gas Works – WorleyParsons Komex/National Grid Property | Completed + Report Available |
| TDP 10: | Thermal Remediation Trial at The Avenue - MEL Limited/Jacobs/East Midlands Development Agency/Homes and Communities Agency | Completed + Bulletin Available |
| TDP 11: | Soil Washing Remediation Trial at The Avenue - DEC NV/Jacobs/East Midlands Development Agency/Homes and Communities Agency | Completed + Bulletin Available |
| TDP 12: | Bioremediation of the Coke Works and Former Colliery at Askern, Doncaster - Ecologia Environmental Solutions Ltd/Carillion Civil Engineering/Yorkshire Forward | Completed + Report Available |
| TDP 13: | A Permeable Reactive Barrier for Remediation of Extremely Polluted Groundwater Associated with a Highly Pyritic Abandoned Colliery Spoil Heap - University of Newcastle upon Tyne and Northumberland County Council | Completed + Report Available |
| TDP 16: | Remediation of Chlorinated Hydrocarbon Contaminated Soils using *Ex Situ* Soil Vapour Extraction – RemedX and ABB | Completed + Report Available |
| TDP 17: | *In Situ* Bioremediation of Cyanide, PAHs and Heterocyclic Compounds using Engineered SEquenced REactive BARrier (SEREBAR) Techniques - Queen's University Belfast/National Grid Property/Parsons Brinckerhoff | Completed + Report Available |

| | | |
|---|---|---|
| TDP 18: | Source Area *in situ* BioREmediation (SABRE) – Akzo Nobel/Archon Environmental/British Geological Survey/Celanese Acetate/Chevron/DuPont/ESI/ General Electric/Environment Agency/GeoSyntec/ Golder Associates/Honeywell/Scientifics/Strategic Environmental Research and Development Program (SERDP)/Shell Global Solutions/Terra Systems/University of Edinburgh/University of Sheffield/US Environmental Protection Agency | Completed + 6 Bulletins Available |
| TDP 20: | Design, Installation and Performance Assessment of a Permeable Reactive Barrier (PRB) to Treat Carbon Disulphide Contaminated Groundwater at a Former Chemicals Site in Manchester - CEL International Ltd, ESI, Akzo Nobel | Completed + Report Available |
| TDP 21: | Remediation of Agricultural Diffuse NITRAte Polluted Waters through the Implementation of a Permeable Reactive BARrier (NITRABAR) – University of Oxford/Queen's University Belfast/Environment Agency/Ecomesh Ltd (N. Ireland)/PGRW (Poland)/Zenenzo (Belgium)/APCO Ltd (Malta)/CL:AIRE | Completed |
| TDP 22: | Improved Ground Gas Risk Prediction by Continuous In-borehole Gas Monitoring (IRP-IGM) - Salamander; Urban Vision; The University of Manchester | Completed + Bulletin Available |
| TDP 23: | *Ex Situ* Treatment of Coal Tar Impacted Soil Using Low Temperature Thermal Desorption at the Former Gasworks, East Dock Street, Dundee - National Grid Property Holdings Ltd; White Young Green; Bilfinger Berger; I & H Brown | Completed |
| TDP 24: | Application of Thermally Enhanced Soil Vapour Extraction (TESVE) to remediate the unsaturated zone at the Western Storage Area (WSA), Harwell - UK AEA; Provectus Group; Nuclear Decommissioning Authority | Completed + Report Available |
| TDP 25: | Decision Support Tool for Innovative *In Situ* Multi-Contaminant Groundwater Remediation - WorleyParsons Komex, National Grid Property, Environment Agency, Bradford City Council and Imperial College | Completed + Bulletin in Progress |
| TDP 26: | *In Situ* Soil and Groundwater Decontamination using Electric Resistive Heating Technology (Six-Phase Heating®) - Terra Vac (UK) Ltd; Taylor Wimpey Ltd | Completed + Bulletin Available |
| TDP 28: | *In Situ* Heating using Radiofrequency (RF) Coupled with Soil Vapour Extraction/High Vacuum Dual Phase Extraction for the Remediation of Contaminated Soil in the Unsaturated Zone - Ecologia Environmental Solutions Ltd; Total UK Ltd | Completed + Bulletin Available |
| TDP 29: | Low-cost Rapid On-Site Quantification of Oil-based Contamination (ROSQUO) - National Grid, Cranfield University and WSP Remediation | Completed |
| TDP 30: | Remediation Field Trials for the Chromium-Contaminated Area at Shawfield, Glasgow - Clyde Gateway Urban Regeneration Company and URS Corporation Ltd | Completed + Bulletin Available |
| TDP 31: | Demonstration of the Arvia® Process of Adsorption Coupled with Electrochemical Regeneration for the On-site Destruction of Organic Contaminants in Groundwater - Arvia Technology Ltd and VertaseFLI. | Completed + Bulletin Available |
| TDP 32: | *In Situ* Chemical Oxidation of Carbon Disulphide Using Activated Persulphate – Arcadis, FMC Environmental Solutions | Completed + Bulletin in Progress |

**Status of CL:AIRE Research Projects**

| Project Code | Project Title and Principal Project Operator | Status |
|---|---|---|
| RP 2: | Hydro-biological Controls on Transport and Remediation of Organic Pollutants for Contaminated Land - Professor Howard Wheater, Imperial College of Science, Technology and Medicine; Professor Jeremy Mason, Kings College, London; and National Grid Property | Completed |
| RP 3: | Processes Controlling the Natural Attenuation of Fuel Hydrocarbons and MTBE in Chalk - Dr Steve Thornton, University of Sheffield | Completed + Report Available |
| RP 4: | The Development of a Statistical Model to Optimise Investigation to Characterise Contaminated Land - Professor Mike Ramsey, University of Sussex | Completed + Report Available |
| RP 5: | The Use of Bonemeal Phosphates to Stabilise Metal Contamination - Dr Eva Valsami-Jones, The Natural History Museum | Completed + Bulletin Available |
| RP 6: | Phytoextraction of Metals: Investigation of Hyperaccumulation and Field Testing - Professor Steve McGrath - Rothamsted Research | Completed + Report Available |
| RP 9: | The Development of an Indicator Methodology to Determine the Plant Availability of Potentially Toxic Elements - Tony Hutchings, Forest Research/Martina Juvara – Arup | Completed + Bulletin Available |
| RP 10: | Comparative Assessment of Approaches for Predicting the Fate and Transport of Dissolved Phase Hydrocarbons in Chalk Aquifers - Natalyn Ala, Atkins Environment | Completed + Bulletin Available |
| RP 12: | Development of an *In Situ* Aquifer Assessment Tool with Risk Management Calculator for Natural Attenuation - Professor Steve Banwart, University of Sheffield | Completed |
| RP 13: | *In situ* Source Treatment for Enhanced Bioremediation Processes (IN-STEP) - Professor Bob Kalin, Queen's University Belfast | Completed + Report Available |
| RP 14: | Use of Longitudinal STREAMTUBE-Based Monitoring Approaches to Determine Contaminant Fate Within the SABRE Intra-Source/Plume Test Cell.- Dr Mike Rivett, University of Birmingham | Completed + Bulletin Available |
| RP 15: | Ferric Iron Remediation and Stabilisation (FIRS): electrokinetic remediation of heavy metal-contaminated back garden sites - Dr Andrew Cundy, University of Sussex, Dr Laurence Hopkinson, University of Brighton | Completed + Bulletin Available |
| RP 16: | Performance Assessment of Stabilised/Solidified Waste Forms (PASSiFy) – Dr Colin Hills, University of Greenwich | Completed |
| RP 17: | The Use of Recycled Construction/Demolition and Industrial Waste as a Substrate in a Novel Manganese Removal Passive Treatment System - Dr Selina Bamforth, University of Newcastle upon Tyne and Dr Karen Johnson, University of Durham | Completed |

| | | |
|---|---|---|
| RP 18: | Optimising Biopile Processes for Weathered Hydrocarbons within a Risk Management Framework - Professor Simon Pollard, Cranfield University | Completed + Bulletin Available |
| RP 19: | Process Envelopes for Cement-based Stabilisation/Solidification (ProCeSS) - Dr Julia Stegemann, University College London | Completed |
| RP 20: | Increased Acceptability of On-Site Measurement by Estimation and Reduction of Uncertainty – Severn Trent Laboratory, University of Sussex, National Grid Property Holdings, Corus UK, | Completed |
| RP 21: | The Use of Biologically Enhanced Charcoal for In Situ Remediation of Contaminated Land – Aspire Defence Ltd, Forest Research, University of Surrey, University of Sheffield | Completed |
| RP 22: | Contaminal – the use of Supercritical Carbon Dioxide (SC-$CO_2$) for the In Situ Sampling and Analysis Contaminants - PJH Partnership Limited, University of Birmingham, Pera Innovation, Lankelma | Completed |
| RP 23: | Regeneration of Brownfield Using Sustainable Technologies (ROBUST) – Dr Karen Johnson and Dr Clare Bambra, Durham University | Project in progress |
| RP 24: | Soil Mix Remediation Technology (SMiRT) – Robert McGall, Eco Foundations and Dr Abir Al-Tabbaa, University of Cambridge | Completed + Bulletin in Progress |
| RP 25: | Cleaning Land for Wealth (CL4W) - University of Warwick, Newcastle University, the University of Birmingham, Cranfield University and the University of Edinburgh. | Project in progress |

Appendix 2

**CL:AIRE RESOURCES**

## Technology Demonstration Project (TDP) Reports and Bulletins

TDP1 - *Remediation trial using low temperature thermal desorption to treat hydrocarbon-contaminated soil (2004)*
TDP2 - *Remediation of Basford Gasworks using soil washing (2003)*
TDP3 - *Design, installation and performance assessment of a zero valent iron permeable reactive barrier in Monkstown, Northern Ireland (2001)*
TDP4 - *Slurry-phase bioreactor trial (2004)*
TDP5 - *A Reducing and Alkalinity Producing System (RAPS) for passive treatment of acidic, aluminium rich mine waters (2005)*
TDP6 - *Biopile field demonstration at the Avenue Coking Works (2004)*
TDP9 - *Design, installation and performance assessment of an air sparge curtain system (2004)*
TDP12 - *Bioremediation of the Coke Works and Former Colliery at Askern, Doncaster (2005)*
TDP13 - *A permeable reactive barrier for remediation of extremely polluted groundwater associated with a highly pyritic abandoned colliery spoil heap (2006)*
TDP16 - *Ex situ soil vapour extraction to remediate chlorinated hydrocarbons (2007)*
TDP17 - *A biological sequential reactive barrier (SEREBAR): design, installation and performance at a former manufactured gas plant site in south west England (2008)*
TDP20 - *Design and installation of a permeable reactive barrier to treat carbon disulphide contaminated groundwater (2009)*
TDP24 - *Application of thermally enhanced soil vapour extraction (TESVE) to remediate the unsaturated zone at the Western Storage Area, Harwell (2010)*
TDP26 - *In situ soil and groundwater decontamination using electric resistive heating technology (2008)*
TDP28 - *In situ radio frequency heating (ISRFH) of hydrocarbon contaminated chalk at a former service station in Kent (2011)*
TDP30 - *In situ 'deliverability' trials using calcium polysulphide to treat chromium contamination at Shawfield, Glasgow (2013)*
TDP31 - *Demonstration of the Arvia™ process of adsorption coupled with electrochemical regeneration for the on-site, ex situ, decomposition of organic contaminants in groundwater (2013)*

## Research Project (RP) Reports

RP3 - *Processes controlling the natural attenuation of fuel hydrocarbons and MTBE in the UK Chalk aquifer* (2006)
RP4 - *Cost-effective investigation of contaminated land (2007)*
RP6 - *Phytoextraction of Metals: Investigation of hyperaccumulation and field testing (2005)*

## Other CL:AIRE Bulletins

### Technical Bulletins (TB)

TB1 - *Introduction to an integrated approach to the investigation of fractured rock aquifers contaminated with non-aqueous phase liquids (2002)*
TB2 - *Multilevel sampling systems (2002)*
TB3 - *Principles and practice for the collection of representative groundwater samples (2008)*
TB4 - *Parameterisation of aquifer hydraulic properties: A contaminant hydrogeology perspective (2009)*
TB5 - *The use of geophysical investigation techniques in the assessment of contaminated land and groundwater (2007)*
TB7 - *Improving the reliability of contaminated land assessment using statistical methods: Part 1 (2004)*
TB9 - *Stabilisation/Solidification Treatment and Remediation: Part 1: Summary of the State of Practice Reports I-IV STARNET (2004)*
TB11 - *A practical guide to investigating DNAPL releases in the subsurface (2004)*
TB12 - *Statistical assessment of contaminated land: Some implications of the 'Mean Value Test' (2006)*
TB13 - *Understanding soil washing (2007)*
TB14 - *Treatment of chromium contamination and chromium ore processing residue (2007)*
TB15 - *Accounting for the groundwater-surface water interface in contaminated land assessments (2011)*

### Case Study Bulletins (CSB)

CSB1 - *Site characterisation in support of monitored natural attenuation of fuel hydrocarbons and MTBE in a chalk aquifer in Southern England (2002)*

CSB2 - *A constructed wetland to treat acid mine drainage from colliery spoils at Quaking Houses, County Durham (2002)*
CSB3 - *Portadown biological reactive barrier (2005)*
CSB4 - *Mine water treatment at Wheal Jane Tin Mine, Cornwall (2004)*
CSB5 - *Remediation trial at The Avenue using stabilisation/solidification and accelerated carbonation technology (2006)*
CSB6 - *Remediation trial at The Avenue using thermal treatment (2006)*
CSB7 - *Remediation trial at The Avenue using soil washing (2008)*
CSB8 - *Public affairs and communications on contaminated land projects (2007)*
CSB9 - *Remediation of a former landfill in Coventry: A practical application of the Definition of Waste: Development Industry Code of Practice in a cluster project (2011)*
CSB10 - *The development of risk based generic assessment criteria (GAC) for assessment of chronic human health risks from exposure to soil contaminants (2011)*
CSB11 - *Remediation of four sites in Northwest England: A successfully completed multi-site, multi-consultant cluster project (2013)*

## Research Bulletins (RB)

RB1 - *Enhanced in situ bioremediation technique for manganese removal from mine waters (2003)*
RB2 - *FIRS Ferric Iron Remediation and Stabilisation: a novel electrokinetic technique for soil remediation and engineering (2003)*
RB3 - *Project SIReN: Research Projects (2006)*
RB4 - *Project SIReN – Future Research Needs (2006)*
RB5 - *Remediation of heavy metal pollution via bone meal amendments to soil: Field and laboratory trials (2007)*
RB6 - *Results of a laboratory microcosm study to determine the potential for bioremediation of chlorinated solvent DNAPL source areas (2006)*
RB7 - *Field Portable X-ray Fluorescence (FPXRF): A rapid and low cost alternative for measuring metals and metalloids in soils (2008)*
RB8 - *Modelling approaches for assessing risks associated with petroleum hydrocarbon spills in the UK Chalk aquifer (2009)*
RB9 - *Electrokinetic Ferric Iron Remediation and Stabilisation (FIRS) of hexavalent chromium contaminated soils: An ex situ field scale demonstration (2009)*
RB10 - *Bioremediation of heavy hydrocarbons – reducing uncertainty in meeting risk-based targets: laboratory to field scale (2010)*
RB11 - *Streamtube project overview: longitudinal transect assessment of the SABRE site DNAPL source zone* (2010)
RB12 - *Modelling food-chain transfer of contaminants in soil to terrestrial ecological receptors (2010)*
RB13 - *The utility of continuous monitoring in detection and prediction of "worst case" ground-gas concentration (2011)*
RB14 - *Generic human-health assessment criteria for arsenic at former coking works sites (2011)*
RB15 - *Generic human-health assessment criteria for benzo[a]pyrene at former coking works sites (2011)*
RB16 - *Generic human-health assessment criteria for benzene at former coking works sites (2011)*
RB17 - *A pragmatic approach to ground gas risk assessment (2012)*

## Site Bulletins (SB)

SB1 - *MNA Bulletin (2005)*
SB2 - *SIReN (MNA) overview and description of projects (2005)*
SB3 - *Coal Mine Sites for Targeted Remediation Research:- The CoSTaR Initiative (2006)*

## Guidance Bulletins (GB)

GB1 - *Stabilisation/Solidification for the treatment of contaminated soil (2005)*
GB2 - *Managing Japanese Knotweed on Development Sites: Code of Practice (2008)*
GB3 - *The Definition of Waste: Development Industry Code of Practice (2011)*

## Treatability Bulletins (TrB)

TrB 1 - *Soil washing (2011)*
TrB 2 - *Permeable reactive barriers (2011)*
TrB 3 - *Chemical oxidation (2013)*

## SABRE Bulletins (SAB)

SAB1 - *Project SABRE (Source Area BioRemediation) – an Overview (2010)*
SAB2 - *Site investigation techniques for DNAPL source and plume zone characterisation (2010)*

SAB3 - *Results of laboratory column studies to determine the potential for bioremediation of chlorinated solvent DNAPL source areas (2010)*
SAB4 - *Insights and modelling tools for designing and improving chlorinated solvent bioremediation applications (2010)*
SAB5 - *Overview of the SABRE field tests (2010)*
SAB6 - *Source Area DNAPL Bioremediation: performance monitoring and assessment (2012)*

## SUBR:IM Bulletins (SUB)

SUB1 - *The role of the development industry in brownfield regeneration (2006)*
SUB2 - *Uncovering the true impacts of remediation (2007)*
SUB3 - *Climate change, pollutant linkage and brownfield regeneration (2007)*
SUB4 - *Measuring sustainability: What's in a number? (2007)*
SUB5 - *Avoiding future brownfield sites through design for deconstruction and the reuse of building components (2007)*
SUB6 - *Communicating risk on contaminated sites: How best to engage with local residents (2007)*
SUB7 - *Acid Tar Lagoons (2008)*
SUB8 - *Community Engagement, Urban Regeneration, and Sustainability (2008)*
SUB9 - *Quality in Land Remediation: Indicators and Protocols for Brownfield Land* (2008)
SUB10 - *The Use of Compost in the Regeneration of Brownfield Land (2008)*
SUB11 - *Integrated remediation, reclamation and greenspace creation on brownfield land (2009)*
SUB12 - *SUBR:IM (Sustainable Urban Brownfield Regeneration: Integrated Management) - An overview (2009)*

## UK Sustainable Remediation Forum (SuRF-UK) Publications

SuRF-UK: A Review of Published Sustainability Indicator Sets: How applicable are they to contaminated land remediation indicator-set development? (2009)
SuRF-UK: A Framework for Assessing the Sustainability of Soil and Groundwater Remediation (2010)
SuRF-UK: Annex 1 - The SuRF-UK Indicator Set for Sustainable Remediation Assessment (2011)
SuRF1 bulletin: Sustainability Assessment: Shell Terminal Facility, Madeira (2013)
SuRF2 bulletin: Upper Heyford - Remediation Options Appraisal (2013)
SuRF3 bulletin: Helpston Contaminated Land Project (2013)

## Other Publications

UK Trade & Investment/EISU & CL:AIRE Trade Guide (2006)
CIEH & CL:AIRE Guidance on Comparing Soil Contamination Data with a Critical Concentration (2008)
The Definition of Waste: Development Industry Code of Practice (2008)
AGS, EIC & CL:AIRE Soil Generic Assessment Criteria for Human Health Risk Assessment (2010)
Defra's "Contaminated land remediation report" (2011)
The Definition of Waste: Development Industry Code of Practice (2011)
Defra's "A Risk/Benefit Approach to the Application of Iron Nanoparticles for the Remediation of Contaminated Sites in the Environment" (2012)
Cluster Guide (2012)

## Online Training

## Podcasts

The SuRF-UK framework for sustainable remediation (2011)
Continuous monitoring of ground-gas (2011)
CL:AIRE DNAPL site characterisation webinar (2011)
CL:AIRE DNAPL site remediation webinar (2011)
Using quality compost webinar: Soil manufacture and improvement in brownfield regeneration (WRAP, 2011)
Using quality compost webinar: Achieving successful biomass production on brownfield land (WRAP, 2011)

## eLearning Modules

Remediation Technologies and Options Appraisal (2012)
Introduction to Soil and Groundwater Risk Assessment (2013)
Sustainable Remediation Appraisal (2013)

**All of the Publications and Online Training can be downloaded from the CL:AIRE website.**

Appendix 3

# CL:AIRE's Activities 2013

CL:AIRE manages a number of industry initiatives, plays a crucial role in many UK and European research projects, and provides training and events for the benefit of the brownfield and land contamination sectors. It also looks for exciting opportunities that will be of interest to the growing number of companies that join as CL:AIRE members. This appendix describes the activities that CL:AIRE undertook during 2013.

## 1. Industry Initiatives

### Land Forum

The Land Forum was set up in July 2011 and evolved from The National Brownfield Forum, originally established by DCLG and Defra. The aim of the Forum is to promote the sustainable use of land. It brings together private and public sector organisations to take an open and forward looking strategic overview of current and future land use issues. The Forum considers UK-wide issues and references overseas experience where appropriate. Representation of organisations on the Forum is kept under review, and seeks to represent a broad spectrum of interests.

CL:AIRE acts as the secretariat for the Forum on a voluntary basis with all notes from the meeting being made publicly available from CL:AIRE's website at www.claire.co.uk/landforum.

### SuRF-UK & SuRF-International

SuRF-UK is the United Kingdom's Sustainable Remediation Forum – an initiative set up to progress the UK understanding of sustainable remediation. CL:AIRE is the secretariat for SuRF-UK.

SuRF-UK Phase 3 continues to progress and Best Management Practices for Sustainable Remediation and a Brief Case & Assessor Pack for Qualitative Sustainable Remediation Assessments are being developed during 2013, with publication in early 2014. Three SuRF-UK bulletins were published to coincide with the CL:AIRE Annual Conference on "Sustainable Land Management". These have each been downloaded over 200 times from the CL:AIRE website. Further case studies are being sought and will be published as they are approved by the SuRF-UK steering group.

All SuRF-UK publications can be found on its dedicated web page www.claire.co.uk/surfuk

CL:AIRE also continues to perform the secretariat function for the International SuRF group meetings, The chairs of the international Sustainable Remediation Forums (SURF) and associated partners meet on a quarterly basis to share progress and learning amongst the different networks and develop opportunities for collaboration (www.claire.co.uk/surfinternational).

### The Definition of Waste: Development Industry Code of Practice (DoWCoP)

The DoWCoP is an initiative to improve the sustainable and cost effective development of land. The DoWCoP provides a clear, consistent and streamlined process which enables the legitimate reuse of excavated materials on-site or their movement between sites with a significantly reduced regulatory burden. In many instances the DoWCoP can provide an alternative to Environmental Permits or Waste Exemptions when seeking to reuse excavated materials.

An audit and research project for the Environment Agency South East has been carried out. The next phase of the project will continue into 2014 which involves selecting exemplar projects to be written up as case studies with a focus on the sustainability benefits achieved in each case versus traditional disposal.

### Register of Materials (RoM)

CL:AIRE keeps a register of materials and services which may fall within the Definition of Waste Code of Practice (DoWCoP). It aims to link material holders with service providers or organisations requiring materials in order to make the process of finding project partners an easier and quicker process.

### Asbestos in Soil

The Asbestos in Soil, Made Ground and Construction and Demolition Materials – Joint Industry Working Group (Asbestos in Soil JIWG for short) was established in November 2011 after The

Environmental Industries Commission (EIC) and CL:AIRE formally joined forces and then invited a wide range of both private and public sector organisations that are all looking to work together to meet the challenges posed by asbestos in soil. The JIWG project will be working alongside the CIRIA research project trying to ensure that the two projects link and complement where possible.

A key part of this project is to meet and engage with the regulators and this includes, primarily HSE, EA (waste, permitting and contaminated land), Department for Transport (DfT), Defra (REACH and contaminated land) and CLG. Further funding is still being sought to develop the project but there is some seed funding to move the project forward. It is anticipated that the JIWG code of practice will not be published until early 2015 due to the HSE reissuing a number of its key asbestos documents which the code of practice needs to refer to.

The dedicated website where all meeting notes from the JIWG are published can be found at: www.claire.co.uk/asbestos

## 2. UK Projects & Publications

**Part 2A Contaminated Land Expert Panel**
CL:AIRE continues to provide technical secretariat services for the Part 2A Contaminated Land Expert Panel. There have been four submissions so far. The Panel has published an observations paper from the four cases that they have reviewed to assist further local authorities that may wish to submit a case for review. The dedicated website for the expert panel can be found at www.claire.co.uk/conlandexpertpanel

**Defra - Category 4 Screening Levels Project**
CL:AIRE has been working on the Defra research project SP1010: Development of Category 4 Screening Levels for Assessment of Land Affected by Contamination. CL:AIRE is working with Mike Quint of Environmental Health Sciences Ltd, Simon Firth of Firth Consultants Ltd, Camilla Pease of ENVIRON, Sarah Bull of AEA Technology Ltd, Ed Stutt of wca environment, Andy Hart, Marc Kennedy and Roy Macarthur of fera and Steve Moreby to deliver this project.

The aim of this research project is to provide technical guidance to support Defra's recently revised Statutory Guidance (SG) for Part 2A of the Environmental Protection Act 1990. Part 2A was originally introduced to ensure that the risks from land contamination to human health, property and the environment are managed appropriately, with the revised SG being designed to address concerns regarding its real-world application.

**Defra – An examination of contaminated land sector activity in England and Wales**
CL:AIRE is part of a project, led by Cranfield University, to work on the state of contaminated land report. The work will involve surveying local authorities to understand their contaminated land activity and the impacts of the revised statutory guidance. The project started in November 2013 and runs for 6 months.

**LNAPL Handbook**
CL:AIRE is managing the publication of an "Illustrated handbook of LNAPL transport and fate in the subsurface". The aim of the project is to prepare a clear and concise, best-practice guidance document that will be a valuable decision support tool for use in discussions and negotiations regarding LNAPL impacted sites. It is hoped that the handbook will become a sister document to the well-known and highly regarded 'DNAPL handbook', published by the Environment Agency in 2003. The document is being prepared for publication in 2014.

**CL:AIRE Projects and Publications**
Outputs from the following technology demonstration projects and research projects have been progressed during 2013 and are due for publication in 2014:
*TDP32: In situ chemical oxidation of carbon disulphide using activated persulphate*
*RP23: Regeneration of brownfield using sustainable technologies (ROBUST)*
*RP24: Soil mix remediation technology (SMiRT)*

## 3. European Projects & Publications

**Enhanced knowledge in mercury fate and transport for improved management of Hg soil contamination (IMaHg)**
The overall aim of this SNOWMAN-funded project was to provide recommendations and to highlight needs to improve management of sites contaminated by mercury. Recommendations and needs will be established based on i) enhanced understanding of mercury forms fate, transport and modelling in the vadose zone and on ii) comparison of available and currently used practices in characterisation, assessment and remediation of mercury contamination.

A final project web-conference was held in November 2013. Several hotspot locations in Europe connected for parts of the meeting and approximately 90 delegates attended across five locations. Project reports on risk assessment, characterisation and remediation of mercury are being reviewed by the project advisory group and will be released in March 2014. After this, CL:AIRE will produce a summary bulletin.

**ADVOCATE European Training Network on in situ remediation**
ADVOCATE (Advancing sustainable in situ remediation for contaminated land and groundwater) is a Marie Curie Initial Training Network consisting of a multidisciplinary consortium of 20 academic and industry partners across 5 European countries, which will research fundamental science, processes and innovative technology applications in the field of in situ remediation (www.theadvocateproject.eu). The network provides high-quality research training to young scientists, through fully-funded Early Stage Researcher (PhD level) and Experienced Researcher (Post-doctoral level) fellowships. The team of 14 fellows employed by ADVOCATE are researching scientific topics which cover a wide range of important pollutant problems. The project is undertaking a comprehensive programme of knowledge transfer activities with other scientific networks and industry bodies in this field

Planning is underway for a 3 day conference on In Situ Remediation on 2-4 September 2014.

**NanoRem**
NanoRem (Taking Nanotechnological Remediation Processes from Lab Scale to End User Applications for the Restoration of a Clean Environment) started in 2013 and is a four year research project. This research project, funded through the European Commission FP7, will focus on facilitating practical, safe, economic and exploitable nanotechnology for in situ remediation. This will be undertaken in parallel with developing a comprehensive understanding of the environmental risk-benefit for the use of nanoparticles (NPs), market demand, overall sustainability, and stakeholder perceptions.

CL:AIRE is involved in the dissemination and knowledge transfer aspects of this project and has already prepared press releases, a communication plan, a newsletter and a project poster and helped to launch the project website www.nanorem.eu

**High Efficiency In Situ Treatment Technology (HEISTT)**
HEISTT was a collaborative research project, funded under the European Commission's FP7 Priority for SMEs Programme, developing an innovative system for the application of remedial chemicals into soil subsurfaces for the purpose of contaminated groundwater treatment. The technology sought to improve treatment application times and facilitate highly efficient remediation. CL:AIRE's role was exploitation and dissemination and results from the field trials will be published during 2014. Further information is available at www.heistt.com

## 4. Training

CL:AIRE launched new eLearning subject modules for risk assessment and sustainable remediation in June 2013. This added to the already popular remediation technologies and options appraisal e-learning modules that were developed in 2012.

CL:AIRE ran 8 one-day courses on the Definition of Waste: Development Industry Code of Practice in 2013 with three in London and Birmingham and two in Manchester.

## 5. Events

**Annual Conference**
Approximately 120 delegates attended the Geological Society for the CL:AIRE Annual Conference in September 2013. The first session on the SuRF-UK initiative focused on the phase 3 work and case studies demonstrating the use of the SuRF-UK framework. The second session presented the uptake and use of the Definition of Waste Code of Practice. An evening panel discussion and networking event proved a popular conclusion to the day.

**Annual Summer Member's Reception**
CL:AIRE held its Annual Members' Reception at The House of Commons in June 2013. Members heard short presentations from Richard Froggatt, CL:AIRE Chair and Jennie Daly from Harrow Estates on CL:AIRE's work over the last year and some perspectives of the market. The event brought together over 70 industry professionals from a diverse range of organisations.

**Geological Society Networking Evening**
With the Geological Society of London, CL:AIRE held its first networking event at Burlington House in May 2013. The theme for the evening was The Importance of Geology in Managing Contaminated Land, and included a presentation from Professor Andy Cundy of the University of Brighton. The event brought together over 50 industry professionals from a range of organisations and was deemed a great success.

## 6. Membership Development and Overseas Business Opportunities

2013 saw a 22% increase in the number of Corporate Members at CL:AIRE, while the number of technical members remained stable. A number of these members have been from overseas with organisations joining from Russia, Israel, Belgium and Canada. These relationships have presented opportunities for CL:AIRE's members to undertake work overseas.

In October 2013, Nicola Harries was invited by Professor Mengfang Chen to present at an international conference in Beijing on the "Legislative Framework in the UK Land Contamination Sector" in October. This enabled CL:AIRE to promote its work and the work of its members to the Chinese market.