TECHNOLOGY AND RESEARCH GROUP

ANNUAL REPORT
2011

Introduction by the TRG Chairman

As the new TRG Chairman from January 1st 2012, I would like to extend my thanks to my predecessor, Mike Pearl of Babcock International Group, for his work over the past three years, and I look forward to his continuing and much-valued contributions to the TRG.

This year we welcomed Mark Hodson to the TRG. Mark is professor of environmental geochemistry and mineralogy at the University of Reading and has current research interests that include mineral weathering, remediation of contaminated land and earthworm ecology. Unfortunately, this year saw the retirement of Professor David Lerner of University of Sheffield from the TRG after 11 years of service, and I would like to thank him for his contribution during his time in the Group.

On the work front, I am pleased to say that the TRG were kept very busy in 2011. The work programme included the review of 12 bulletins and two project applications, together with the answering of many 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, Management Team and staff 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 my role as Chairman for the next three years.

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 2011.

Mike Summersgill
January 2012

BACKGROUND TO 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 Technology and Research Group (TRG) provide strategic review, support and steering functions for CL:AIRE's activities.

In 2009, changes were made to CL:AIRE's governance and the TRG became a sub-committee of the CL:AIRE Board. As a result, the TRG chairman is required to be a trustee of the Board and provide the link to the strategic direction of the company.

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. 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 ensure the real added value to CL:AIRE.

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:-

- scientific validity of the application;
- robust nature of the methodology;
- contribution to the UK contaminated land marketplace;
- suitable assessment of site criteria; and
- competencies in forms of project management.

The process does allow for constructive feedback and resubmission, but not all applicants get through.

TRG MEMBERS AT END OF 2011

Chairman: Mr Mike Pearl – Babcock International Group
Deputy Chair: Mr Mike Summersgill – SEnSE Associates
Mr Bob Barnes – Environment Agency
Dr Brian Bone – Bone Environmental Consultant
Dr John Campbell – SAC Associates
Professor Max Coleman – Caltech
Mr Steve Edgar – Vertase FLI
Professor Mark Hodson, University of Reading
Dr Theresa Kearney – Northern Ireland Environment Agency
Professor Phil Morgan – The Sirius Group
Dr Mike Rivett – University of Birmingham
Professor Jonathan Smith – Shell Global Solutions

THE 2011 ANNUAL REPORT

1. TRG ACTIVITIES

1.1 TRG Meetings

During 2011, four TRG meetings were held.

1.2 Project Applications Reviewed

The TRG reviewed one technology demonstration project application and one research project application during 2011. 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	Under review, awaiting further information
Stabilisation/solidification & permeable reactive barrier using soil mix technology	R	Project #171, approved as RP24

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 Project Reports
There were no CL:AIRE Project Reports to review in 2011.

1.3.2 CL:AIRE Bulletins
TRG members reviewed 12 bulletins during 2011, 11 of which were published and 1 of which is due to be published in 2012 (shown in italics below):

Bulletin Type	Bulletin No.	Bulletin Title
Case Study	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
Case Study	CSB10	The development of risk based generic assessment criteria (GAC) for assessment of chronic human health risks from exposure to soil contaminants
Guidance	GB3	The Definition of Waste: Development Industry Code of Practice
Research	RB13	The utility of continuous monitoring in detection and prediction of "worst case" ground-gas concentration
Research	RB14	Generic human-health assessment criteria for arsenic at former coking works sites
Research	RB15	Generic human-health assessment criteria for benzo[a]pyrene at former coking works sites
Research	RB16	Generic human-health assessment criteria for benzene at former coking works sites

TDP	*TDP25*	*Decision support tool for innovative in situ multi-contaminant groundwater remediation*
TDP	TDP28	*In situ* radio frequency heating (ISRFH) of hydrocarbon contaminated chalk at a former service station in Kent
Technical	TB15	Accounting for the groundwater-surface water interface in contaminated land assessments
Treatability	TrB 1	Soil washing
Treatability	TrB 2	Permeable reactive barriers

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, a number of issues, including the following:

- Input to Defra Research Project: Contaminated land remediation
- Review of Defra Research Project: Application of iron nanoparticles in remediation
- Input to the development of CL:AIRE's Contaminated Land Qualifications
- Review of the *SuRF-UK Indicator Set for Sustainable Remediation Assessment* document
- Delivery of CL:AIRE's remediation technology training
- Evaluation of TRG Member skills and gap analysis
- Identify potential for CL:AIRE working abroad
- Review of a potential bulletin on the application of geosynthetic membranes
- Judge entries for the Remediation Category at the Environment and Energy Awards presented at SustainabilityLive 2011
- Assess the concept of a new product bulletin range
- Comment on the proposed content of CL:AIRE's forthcoming State of the Market Report
- Comment on whether supersaturated oxygenated water technology could be useful to the remediation sector
- Review a proposal for a Contaminated Land Code of Ethics, based on skills, training, and professional behaviour, considered as part of CL:AIRE's Membership Scheme
- Review a proposal for a verified trade register for contaminated land practitioners
- Review two treatability bulletins on soil washing and permeable reactive barriers and assess the need for further technologies to be covered in the series
- Comment on remediation strategies proposed by two local authorities
- Assess a proposal to review and publish detailed gasworks profiles

2. A LOOK AHEAD TO 2012

Building on the achievements of 2011, a new wave of CL:AIRE outputs is predicted for the forthcoming year. It is expected that the TRG will be called upon to review 2 new project applications and 8 TDP and RP reports or bulletins as well as contributing strategic review, support and steering functions for CL:AIRE's activities.

This document was prepared by Dr Rob Sweeney, Senior Project Manager, 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 i*n 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 + 5 Bulletins Available, 1 in Progress
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 + Bulletin in Progress
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 + Report in Progress
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 + Bulletin in Progress
TDP 30:	Remediation Field Trials for the Chromium-Contaminated Area at Shawfield, Glasgow - Clyde Gateway Urban Regeneration Company and URS Corporation Ltd	Completed + Bulletin in Progress
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 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 + Bulletin in Progress
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 + Bulletin in Progress
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 + Bulletin in Progress
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 + Bulletin in Progress
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	Project in progress

Appendix 2

CL:AIRE PUBLICATIONS

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)*

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)*

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)*

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)

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*
SAB4 - *Insights and modelling tools for designing and improving chlorinated solvent bioremediation applications (2010)*
SAB5 - *Overview of the SABRE field tests (2010)*

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)

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 Contaminated land remediation report (2011)
The Definition of Waste: Development Industry Code of Practice (2011)

All of the Publications can be downloaded from the CL:AIRE website.