A CL:AIRE demonstration project on a nuclear licensed site and other CL:AIRE initiatives

CIRIA BRMF and SAFESPUR Workshop
7th October 2009, Birmingham

Dr Rob Sweeney, CL:AIRE

CONTAMINATED LAND: APPLICATIONS IN REAL ENVIRONMENTS

CL:AIRE

1 GREAT CUMBERLAND PLACE | 7TH FLOOR | LONDON | W1H 7AL
T - 020 7258 5321 | F - 020 7258 5322 | www.claire.co.uk

Contents

- Introduction
- CL:AIRE Review Process
- TDP24 Case Study
- CL:AIRE Projects
- Other Current Initiatives
- Summary

CL:AIRE

n1

Introduction to CL:AIRE

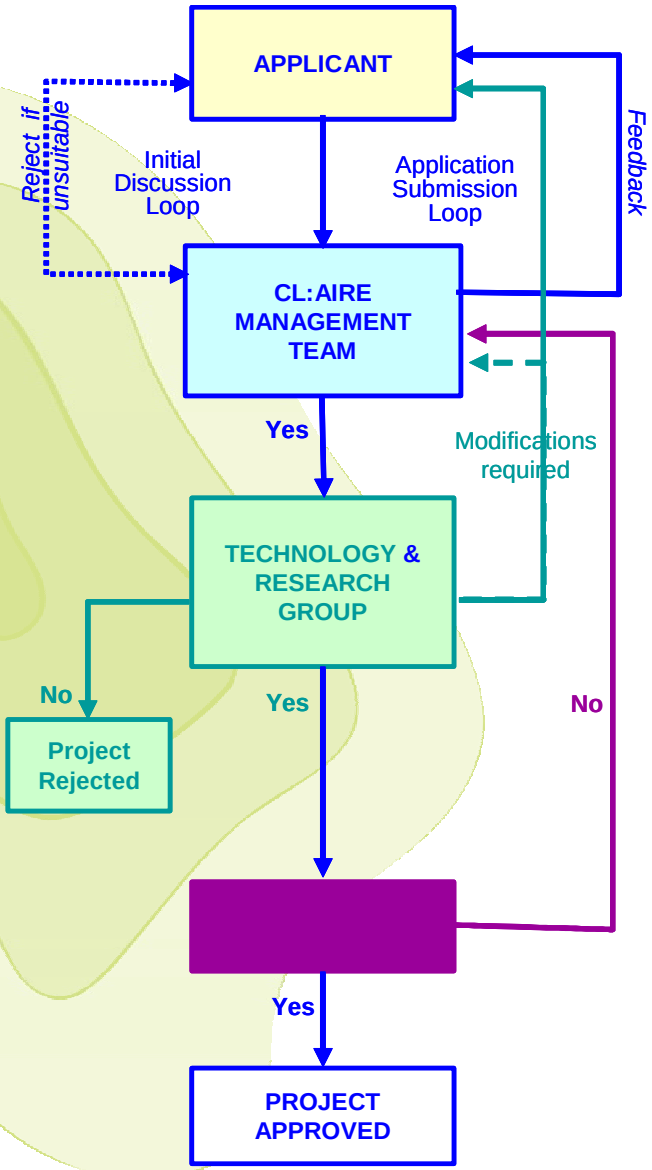
- Celebrating 10th Anniversary this year
- Independent not-for-profit organisation set up by Govt and SAGTA
- Objectives include:

  - to stimulate the regeneration of contaminated land in the UK by raising awareness of, and confidence in, practical and sustainable **remediation technologies** and effective **methods for monitoring and investigating** sites.

  - to disseminate technology demonstrations and research

n1 under "to disseminate remediation research" we don't just disseminate research. Would not like to give wrong idea that we are a research org. How about disseminate remediation knowledge or dissemination technology and research information

nicola, 15/09/2009



CL:AIRE Review Process

The project is discussed with the CL:AIRE Management Team (CMT) to ensure fit within CL:AIRE remit and submission of project application form.

The TRG will review the application, scoring it against a project evaluation form. The TRG evaluation will result in:

- Acceptance
- Conditional acceptance
- Rejection

The Board ratifies or rejects a project on a majority vote basis.

CL:AIRE

Technology and Research Group

Mike Pearl – UKAEA (Chair)
Mike Summersgill – RSK Ltd (Deputy chair)
Dr Brian Bone – Environment Agency
Dr John Campbell – SAC Associates
Prof Max Coleman – Caltech
Steve Edgar – Vertase FLI
Dr Theresa Kearney – Northern Ireland Environment Agency
Dr David Lerner – Uni of Sheffield
Prof Andy Moffat – Forest Research
Prof Phil Morgan – The Sirius Group
Dr Mike Rivett – Uni of Birmingham
Prof Jonathan Smith – Shell Global Solutions

What is the TRG looking for?

- 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

TDP24 Case Study

Application of Thermally Enhanced Soil Vapour Extraction to Remediate the Unsaturated Zone at the Western Storage Area, Harwell (Provectus Group and RSRL)

Background

- Until 1930s: Racehorse stables
- 1935 to 1946: RAF airfield
- Nuclear R&D site for over 40 years
- Since mid-1990s, focus on decommissioning and clean up for redevelopment (“Harwell Science and Innovation Campus”)

TDP24 Case Study

Western Storage Area (WSA)

- 25 shallow pits (4-5 m) used for disposal of chlorinated solvents (approx 20 tonnes) and other chemicals
- WSA utilised from 1970 to early 1990s (solvent disposal ceased in 1977)
- Pits were excavated and contents removed in 2004
- Residual suite of VOCs & hydrocarbons in unsaturated zone of Chalk up to c25 mbgl

Project Objectives

- Target contaminants, reduce loading significantly & minimise emissions
- Undertake pilot trial - design & configure remediation evaluating multiple techniques
- Undertake phased remediation as NDA funding becomes available

TDP24 Case Study

Pilot Trial

•Site characterisation to gain current data on unsaturated zone contamination profile

•Test SVE technology application

•Examine:

- –Conventional SVE
- –Targeted depths
- –Assistance of air/ozone sparging
- –Thermal enhancement

Recommendations

Recommended that full-scale remediation of the unsaturated zone is undertaken within the WSA comprising:

•SVE in the vicinity of the former chemical waste disposal pits.

•Thermal enhancement of the SVE in areas of gross contamination notably beneath the footprint of the most severely contaminated disposal pits

TDP24 Case Study

Phased Remediation Works

•Phased remediation focused on pit areas and intermediate zones commencing in the most highly impacted north western part of WSA

•Utilise existing monitoring well installations and field trial wells or equipment in order to save installation costs

•Progressive broad-scale SVE from a network of extraction wells targeted at depths from 6 mbgl to 20 mbgl on a hexagonal grid spacing (6 m in areas between pits, 3 m in and around pit locations)

•Heating of the highly contaminated zone beneath pit areas at depths between 5 – 15 mbgl allowing thermal enhancement of the SVE process

TDP24 Case Study

Methodology

•Conductive heating and vacuum extraction applied simultaneously to the impacted zone

•Heater contains an electrically powered heating element with an operating temperature of 500-800^{o}C

•Heat transfer by thermal conduction can give rise to target zone heating between 100-350^{o}C

•Contaminants are partitioned into the vapour phase. Vapours are collected continuously using centrally located SVE

TDP24 Case Study

Results and Conclusions

Extraction Rates:

- –At start of un-enhanced trial (Nov 05) - 3kg/day
- –During Phase 1 thermal enhancement (Jan 06) – 17kg/day
- –End of Phase 2 enhancement (April 07) - 3kg/day
- –During Phase 3 enhancement (Oct 07) - 2kg/day
- –Following Phase 3 enhancement (Jan 08) - 0.3kg/day

•No free product in nearby groundwater monitoring wells

•VOC and SVOC concentrations in condensate are two orders of magnitude lower following TESVE

•Estimate of total mass of contaminants removed from WSA unsaturated zone currently stands at approximately 1 tonne

Final TDP24 Report expected to be available by the end of 2009.

TRG Influence

- General TRG comments
- TDP24 work plan
- TDP24 report

  –Introduction

  –Background to technology

  –Site description

  –Demonstration support issues

  –Pilot trials and remediation design

  –Full-scale remediation set up

  –Performance monitoring and evaluation

  –Economic and environmental considerations

  –Conclusions

  –Lessons Learnt

CL:AIRE Projects

Remediation Technologies

- Thermal treatment (TDP1, TDP10, TDP23, TDP24, TDP26, TDP28)
- Permeable reactive barrier (TDP3, TDP13, TDP17, TDP20, TDP21)
- *Ex situ* bioremediation (TDP4, TDP6, TDP12)
- Soil washing (TDP2)
- Wetlands (TDP5)
- S/S & accelerated carbonation technology (TDP8)
- Air sparging (TDP9)
- Soil vapour extraction (TDP16, TDP24)
- Source area *in situ* bioremediation (SABRE) (TDP18)
- *In situ* reductive dechlorination of chlorinated solvents (TDP19)
- Chemical reduction (TDP30)

-plus 13 Research Projects (e.g. phytoremediation, charcoal)

Site Investigation & Monitoring

- In-borehole gas monitoring technology (TDP22)
- Rapid on-site quantification of oil-based contamination (TDP29)

-plus 6 Research Projects (e.g. cost-effective SI)

Request for new CL:AIRE Projects

Looking for new TDPs and RPs from the nuclear sector:

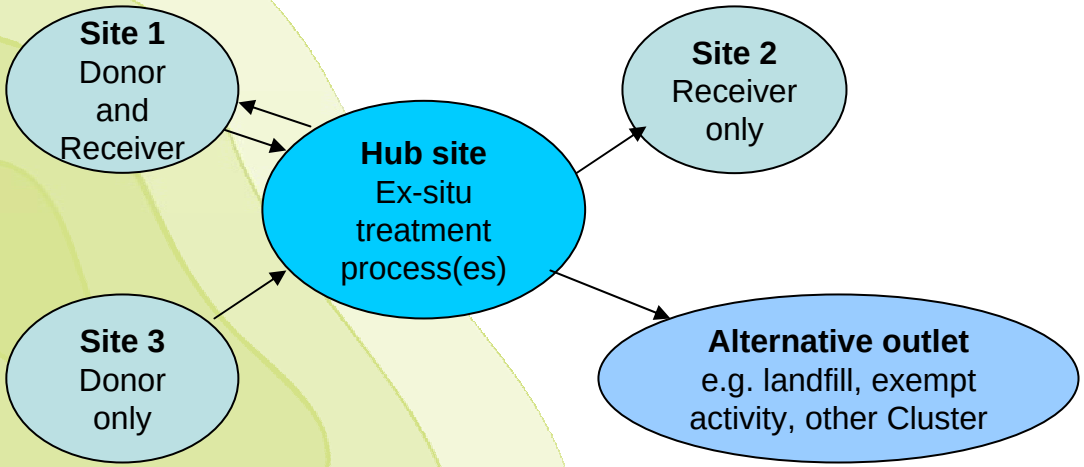
- Independent TRG review
- Global dissemination

Current Initiatives: SuRF UK

- Sustainable Remediation Forum
- UK-based (also SURF in the USA)
- Cross Sector Representation
- Mission Statement:
  To develop a framework in order to embed balanced decision making in the selection of the remediation strategy to address land contamination as an integral part of sustainable development.
- Draft Framework at Consultation Stage, ending 31st October 2009

www.claire.co.uk/surfuk

Current Initiatives: Cluster



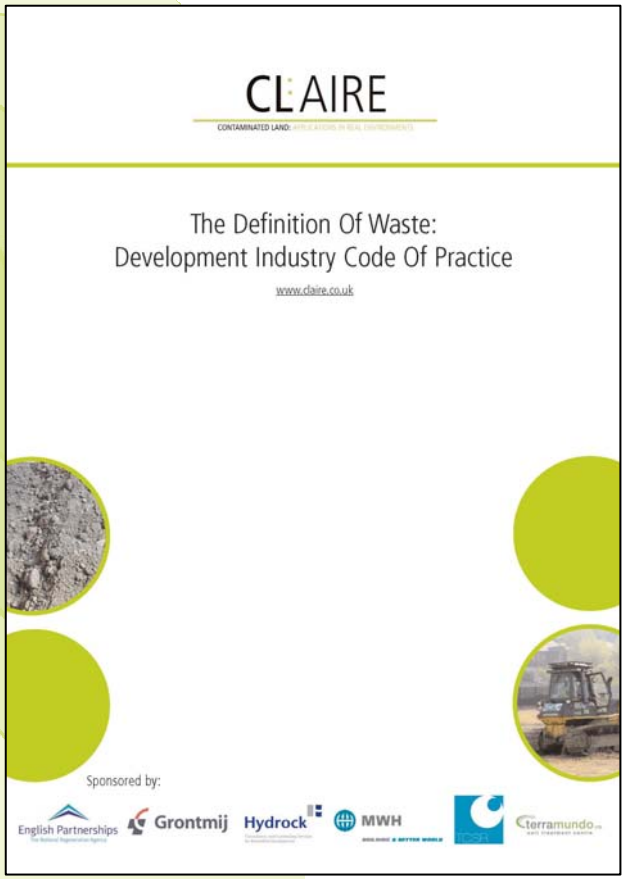
- Method for developing and remediating a group of sites that are relatively close to each other.
- Cluster projects have three guiding principles in that they:
  - –Are temporary
  - –Are local
  - –Provide a more sustainable way of developing land

Cluster Guide – available later this month

www.claire.co.uk/cluster

CL:AIRE

Current Initiatives: Waste CoP



- Provides greater clarity over what is waste and what is not
- Greater clarity leads to consistency and certainty
- Improved efficiency
- Supports diversion from landfill
- Supports reduction in primary aggregate use
- Supports reduction in haulage costs

www.claire.co.uk/CoP

CL:AIRE Training

Training developed from knowledge gained from TDPs and RPs

- Options Appraisal & Technologies Overview
- Technology modules
  - MNA, PRB, Air Sparging & SVE, Ex and In Situ Bioremediation, Chemical Oxidation, S/S, Soil Washing, Thermal Desorption
- Other modules
  - Definition of Waste: Development Industry Code of Practice
  - CLEA Model Training
  - Environmental Risk Communication
  - Risk Assessment

CL:AIRE Membership

- Now Company-wide
- View the latest Technology Demonstration Reports (TDPs) and Research Project Reports (RPs) in the online publications library;
- Exclusive 15% discount on attending any CL:AIRE training modules and conferences;
- Immediate access to CL:AIRE's electronic Bulletins;
- Frequent Consultation Tracker eAlerts;
- Annual Members Social Networking Event;
- Priority Sponsorship Opportunities for select Events and Initiatives

….Sign up at www.claire.co.uk/membership

Summary of Key Achievements

- Produced over 70 Publications
- Evaluated and Approved over 50 Projects through CL:AIRE's Technology & Research Group
- Dissemination to Contacts Database of ~5000
- Convened over 150 events
- Established & trusted brand in Technical Publications & Training
- Leading in delivery of National Frameworks / Initiatives
- Excellent reputation in Europe & Worldwide

Thank you

CONTAMINATED LAND: APPLICATIONS IN REAL ENVIRONMENTS

CL:AIRE

1 GREAT CUMBERLAND PLACE | 7TH FLOOR | LONDON | W1H 7AL
T - 020 7258 5321 | F - 020 7258 5322 | www.claire.co.uk